

**SIGNATURES**

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Approved-Dennis McLain, Office of Institutional Coordination, FWO-FE	Date

<u>Section</u>	<u>Title</u>	<u>Section Rev. No.</u>	<u>Date</u>
i	Signature Sheet	0	6/29/99
ii	Table of Contents	0	6/29/99
iii	Record of Revisions	0	6/29/99
<b>100</b>	<b>GENERAL REQUIREMENTS</b>		
<b>101</b>	<b>Introduction</b>		
<b>102</b>	<b>Planning and Composition of Drawings</b>		
102.1	General Formatting Guidelines	0	6/29/99
102.2	Drawing Legend	0	6/29/99
102.3	Construction Drawing Revision Procedures	0	6/29/99
102.4	As-Built Revision Procedures	0	6/29/99
<b>103</b>	<b>Planning and Composition of Drawings</b>		
103.1	General Guidelines	0	6/29/99
103.2	List of Abbreviations	0	6/29/99
<b>200</b>	<b>DRAFTING REQUIREMENTS</b>		
<b>201</b>	<b>Drawings</b>		
201.1	Drawing Sheet Sizes and Format	0	6/29/99
201.2	Final Drawings	0	6/29/99
201.3	“Not for Construction” Notation	0	6/29/99
201.4	Sealed Drawings	0	6/29/99
<b>202</b>	<b>Construction Drawings Title Blocks</b>		
202.1	Title Block for use on Construction Drawings	0	6/29/99
202.2	Description of the Construction Drawing Title Block Contents	0	6/29/99
202.3	Title Block and Drawing Format for Engineering Studies, Design Criteria and Conceptual Design Reports	0	6/29/99
202.4	Description of Engineering Study Design Criteria and Conceptual Design Report Title Block Contents	0	6/29/99

<u>Section</u>	<u>Title</u>	<u>Section Rev. No.</u>	<u>Date</u>
<b>203</b>	<b>Title Sheet</b>		
203.1	General Requirements	0	6/29/99
203.2	Example of Title Sheet	0	6/29/99
203.3	Description of Title Sheet Contents	0	6/29/99
203.4	Location Plan	0	6/29/99
203.5	Product Options and Substitutions	0	6/29/99
<b>204</b>	<b>Plan Orientation</b>		
204.1	Guidelines for Plan Orientation on All Drawings	0	6/29/99
<b>205</b>	<b>North Arrow</b>		
205.1	Example of North Arrow	0	6/29/99
205.2	General Requirements for North Arrow	0	6/29/99
<b>206</b>	<b>Partial Plans</b>		
206.1	Match Lines	0	6/29/99
206.2	Key Plans	0	6/29/99
<b>207</b>	<b>Submittal Sheet</b>		
207.1	Criteria and Guidelines for Submittal Sheet	0	6/29/99
207.2	Guidelines for Numbering the Required Submittals	0	6/29/99
207.3	Example of Submittal Sheet Content	0	6/29/99
<b>208</b>	<b>Drawing Scales</b>		
208.1	Graphic Scales	0	6/29/99
208.2	Dimension Line Convention and Text Orientation	0	6/29/99
208.3	Consistency of Drawing Scales	0	6/29/99
208.4	Confined Space Drawing Scales	0	6/29/99
208.5	Dimensions Not to Scale	0	6/29/99
208.6	No Scale Drawings	0	6/29/99
<b>209</b>	<b>Dimensioning</b>		
209.1	General	0	6/29/99
209.2	Dimension Line Convention and Text Orientation	0	6/29/99
209.3	Dimension Line Termination	0	6/29/99

<u>Section</u>	<u>Title</u>	<u>Section Rev. No.</u>	<u>Date</u>
209.4	Plan Dimensions	0	6/29/99
<b>210</b>	<b>Order of Disciplines</b>		
210.1	Organization of Drawing Sets	0	6/29/99
<b>211</b>	<b>Order of Drawings Within a Drawing Set and Within a Discipline</b>		
211.1	Preferred Order of Drawings	0	6/29/99
<b>212</b>	<b>Line Work</b>		
212.1	Basic Line Width	0	6/29/99
<b>213</b>	<b>Standardization of Text</b>		
213.1	Font Styles and Text Size Requirements	0	6/29/99
213.2	Text Formatting Conventions	0	6/29/99
<b>214</b>	<b>Sections, Elevations, Details and Callouts</b>		
214.1	Reference Designations	0	6/29/99
214.2	Protocol for References and Callouts	0	6/29/99
214.3	Examples of Protocols	0	6/29/99
214.4	Section Symbols	0	6/29/99
214.5	Detail Symbols	0	6/29/99
214.6	Section, Elevation and Detail Titles	0	6/29/99
214.7	Interior Elevation Symbols	0	6/29/99
214.8	Exterior Elevations	0	6/29/99
214.9	Keyed Notes	0	6/29/99
<b>215</b>	<b>Electronic CAD File Conventions</b>		
215.1	Electronic File Name Convention	0	6/29/99
215.2	Line Width Assignment in Electronic Files	0	6/29/99
215.3	CAD Layering Guidelines	0	6/29/99
215.4	Electronic File Format for Final Deliverables	0	6/29/99
<b>300</b>	<b>DRAWING SYMBOLS AND CONVENTIONS</b>		
<b>301</b>	<b>Symbols</b>		

<u>Section</u>	<u>Title</u>	<u>Section Rev. No.</u>	<u>Date</u>
301.1	Where to Use Symbols	0	6/29/99
301.2	Size of Symbols	0	6/29/99
301.3	Symbol Types	0	6/29/99
<b>302</b>	<b>Construction Document Symbols</b>		
<b>303</b>	<b>Civil Drawings and Graphic Symbols</b>		
<b>304</b>	<b>Structural Drawings</b>		
304.1	Designation of Column Lines	0	6/29/99
304.2	Structural Steel Framing Drawings	0	6/29/99
304.3	Structural Steel Shapes	0	6/29/99
304.4	Reinforced Concrete	0	6/29/99
304.5	Structural Drawings	0	6/29/99
304.6	Reinforced Concrete Drawings	0	6/29/99
304.7	Structural Steel Drawings	0	6/29/99
<b>305</b>	<b>Architectural Symbols</b>		
<b>306</b>	<b>Mechanical Drawings and Symbols</b>		
306.1	Mechanical Drawings	0	6/29/99
306.2	Mechanical Equipment List	0	6/29/99
306.3	Class "A" Demolition Schedule	0	6/29/99
306.4	Class "A" Equipment Code Assignment Schedule	0	6/29/99
306.5	Mechanical Symbols	0	6/29/99
<b>307</b>	<b>Electrical Symbols</b>		

<u>Chapter Rev. No.</u>	<u>Date</u>	<u>Description of Revision</u>
0	6/29/99	Document rewritten and reformatted to support LIR 220-03-01. This manual supersedes the Facilities Engineering Standards Drafting, Volume 2, revision no. 7, dated 4/17/98.

**101 INTRODUCTION**

This manual sets the criteria for drafting (graphic) conventions. These drafting conventions are intended for use when creating or modifying drawings for LANL facilities construction projects and preparing as-built drawings. The standards are intended to promote consistency among LANL drawing packages as well as promote common understanding between the designers, trades people and operations and maintenance personnel.

**102 PLANNING AND COMPOSITION DRAWINGS****102.1 General Formatting Guidelines**

Proper planning and presentation of the drawing sheets is very important. Make every effort to anticipate and plan for the drawing space required, the symbols, consistent terminology, and coordination of disciplines.

- 102.1.1** Map space in advance for each plan, section, elevation, detail, schedule, etc.
- 102.1.2** Arrange each drawing so that it will not appear unbalanced or crowded.
- 102.1.3** Use drafting conventions that are clear, uniform and easily understood.
- 102.1.4** Use drafting conventions that are clear, when the sheet is reduced to half size.
- 102.1.5** Use consistent line widths and line types in a drawing set for clarity and accuracy.
- 102.1.6** Do not combine architectural, mechanical, or electrical systems on the same drawing sheet.
- 102.1.7** Show or call out information the least number of times possible, preferably once.
- 102.1.8** Coordinate embedments, inserts, block-outs, and penetration with all disciplines to ensure that the drawing set conveys consistent information.
- 102.1.9** Use terminology in the drawing set which is consistent with the terminology in the related specifications.

**102.2 Drawing Legend**

- 102.2.1** Provide a standard legend of symbols and line treatment on the first drawing sheet of each discipline.
- 102.2.2** If appropriate, it is acceptable to use a dedicated drawing sheet ("G" sheet) to show symbols used in the entire drawing package.

**102.3 Construction Drawing Revision Procedures**

- 102.3.1** Indicate revisions by numbers, beginning with the number "1".



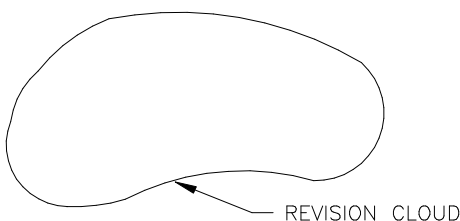
Use a sequential number for each revision on a sheet.

- 102.3.2** Do not use Revision 0 (zero) for the first issue of the drawing.
- 102.3.3** Number each revised sheet independently.
- 102.3.4** Enter the appropriate information in the revision block of the drawing title block.
- 102.3.5** If a drawing sheet has no revision, do not enter any information in the revision block of the title block.
- 102.3.6** In the List of Drawings indicate each revised drawing sheet by drawing a revision cloud around the drawing title. Also, indicate a revision of the sheet that contains the List of Drawings.
- 102.3.7** Using revision clouds to completely encircle the revised drawing elements. On subsequent revisions, delete the previous revision clouds. A revision cloud is illustrated below.
- 102.3.8** A revision cloud is not required on a drawing sheet if the whole sheet was revised or a new sheet was added to the drawing set.
- 102.3.9** Indicate the current revision number in the "NO." column of the revision block and "REV." block of the title block.
- 102.3.10** Indicate the current revision date in the "DATE" column of the revision block.
- 102.3.11** Hand written initials or signatures are not required in the title block, but are required in the revision block.

The following are graphic examples of the Title Block modifications required when revisions have been made on a Drawing Sheet.

1	1/1/95	MN	ADDED EXHAUST FAN IN ROOM 101	DM	AT	MN	MN	GL
NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	SUB	APP

DRAWING NO.	REV.
C76391	1



## 102.4 As-Built Revision Procedures

- 102.4.1** Delete all revision clouds from the drawing sheet.
- 102.4.2** Do not use revision clouds to denote As-Built changes.
- 102.4.3** Enter the next sequential revision number in the drawing title block. Enter that same number in the revision block.
- 102.4.4** In the "REVISION" column of the revision block enter "As-Built With Changes", or "As-Built Without Changes", whichever is appropriate.
- 102.4.5** A detailed description of the "As-Built" changes is not required.

**103 ABBREVIATIONS****103.1 General Guidelines**

When abbreviating, comply with the list in this section. Discipline specific abbreviations can be found in the Facility Engineering Manual.

The above referenced abbreviations are not intended to be a complete listing of all possible abbreviations required for a project. If additional abbreviations are required, use standard industry abbreviations. An abbreviations legend is required for abbreviations used in the drawing set that are not listed in the Facility Engineering Manual.

- 103.1.1** Do not abbreviate single words with four letters or less, except for some very commonly used abbreviations such as:

& and  
@ at

- 103.1.2** Avoid using abbreviations with more than one meaning except where they occur in different disciplines or when used in a context that makes the meaning unequivocally clear.

- 103.1.3** In general, write abbreviations in capital letters with no lower case letters or punctuation. Use punctuation only when the abbreviation can be interpreted as a word without the punctuation such as: NO (number). In this case, a period is needed for clarity.

ABANDON	ABAN	AMPERE	AMP
ABOVE	ABV	AMPERE HOUR	AMP HR
ABOVE FINISHED FLOOR	AFF	AMPERE HOUR METER	AHM
ABOVE FINISHED GRADE	AFG	AMPERE INTERRUPTING CAPACITY	AMP IC
ABOVE FINISHED SLAB	AFS	AMPLIFIER	AMPL
ABOVE RAISED FLOOR	ARF	AMPLITUDE MODULATION	AM
ABOVE SEA LEVEL	ASL	ANALOG	ANLG
ABOVE SUSPENDED CEILING	ASC	ANCHOR	AHR
ABRASIVE	ABRSV	ANCHOR BOLT	AB
ABSOLUTE	ABS	ANNUNCIATOR	ANN
ABUTMENT	ABUT	ANODIZED	ANOD
ACCESS DOOR	AD	ANTENNA	ANT
ACCESS FLOOR	AF	APARTMENT	APT
ACCESS PANEL	AP	APPARATUS	APPAR
ACCUMULATOR	ACCUM	APPARATUS DEW POINT	ADP
ACETYLENE	ACET	APPENDIX	APPX
ACID PROOF	AP	AQUASTAT	AQST
ACID VENT	AV	ARCHITECT (URAL)	ARCH
ACID WASTE	AW	ARCHITECT/ENGINEER	A/E
ACID-RESISTANT	ACID RES	AREA DRAIN	AD
ACID-RESISTANT CAST IRON	ACID RES CI	ARMATURE SHUNT	ARM SHT
ACID-RESISTANT PIPE	ACID RES P	ASPHALT	ASPH
ACID-RESISTANT VENT	ACID RES V	ASPHALTIC CONCRETE	AC
ACID-RESISTANT WASTE	ACID RES W	ASPHALTIC CONCRETE PAVING	ACP
ACOUSTICAL	ACOUS	ASPIRATOR	ASPRTR
ACOUSTICAL INSULATION	ACOUS INSUL	ASSEMBLY	ASSY
ACOUSTICAL PANEL	ACOUS PNL	ASSOCIATION	ASSN
ACOUSTICAL PLASTER	ACOUS PLAS	ASYMMETRICAL	ASYM
ACOUSTICAL TILE	ACOUS TILE	ATMOSPHERE	ATM
ACOUSTICAL WALL TREATMENT	ACWT	ATMOSPHERIC VENT	ATM V
ACRYLIC PLASTIC	ACR PL	ATTACHMENT	ATCH
ACRYLONITRILE BUTADIENE STYRENE	ABS	ATTEMORATOR	ATTEMP
ACTUATOR	ACTR	AUDIO FREQUENCY	AF
ADAPTER	ADPTR	AUDIO VISUAL	AV
ADDENDUM	ADDM	AUTOMATIC AIR DAMPER	AAD
ADDITIONAL	ADDL	AUTOMATIC AIR VENT	AAV
ADHESIVE	ADH	AUTOMATIC CHECK VALVE	ACKV
ADJACENT	ADJC	AUTOMATIC CONTROL PANEL	ACP
ADJUSTABLE	ADJ	AUTOMATIC CONTROL SYSTEM	ACS
AFTER FILTER	AF	AUTOMATIC CONTROL VALVE	ACNV
AGGREGATE	AGGR	AUTOMATIC DOOR CLOSER	ADC
AGGREGATE BASE COURSE	ABC	AUTOMATIC DOOR SEAL	ADS
AHEAD	AHD	AUTOMATIC FREQUENCY CONTROL	AFC
AIR BASEBOARD	AIR BB	AUTOMATIC SPRINKLER DRAIN	ASD
AIR BLAST	AB	AUTOMATIC TRANSFER SWITCH	ATS
AIR BLAST CIRCUIT BREAKER	ABCB	AUTOMATIC TRANSFORMER	AUTO XFMR
AIR BLAST TRANSFORMER	ABT	AUXILIARY POWER UNIT	APU
AIR BREAK SWITCH	ABSW	AUXILIARY SWITCH	ASW
AIR CHAMBER	AIR CH	AVENUE	AVE
AIR CIRCUIT BREAKER	ACB	AZIMUTH	AZ
AIR CONDITIONING	AC	BACK OF CURB	BC
AIR CONDITIONING UNIT	ACU	BACK TO BACK	B/B
AIR COOLED CONDENSER	ACL	BACK WATER VALVE	BWV
AIR COOLED CONDENSING UNIT	ACCU	BACKDRAFT DAMPER	BDD
AIR HANDLING UNIT	AHU	BACKFLOW PREVENTER	BFP
AIR HORSEPOWER	AHP	BACKSIGHT	BS
AIR SEPARATOR	AS	BAFFLE	BAF
AIR SUPPLY UNIT	ASU	BALANCE	BAL
AIR TIGHT	AT	BALANCE FITTING	BALF
AIR VENT	AV	BALANCING DAMPER	BAL DMPR
ALARM	ALM	BALANCING VALVE	BAL V
ALARM ANNUNCIATOR PANEL	AAP	BALL BEARING	BBRG
ALARM CHECK VALVE	ACV	BALL VALVE	BV
ALTERATION	ALTRN	BALLAST	BLST
ALTERNATE	ALT	BALLED AND BURLAPPED	B&B
ALTERNATE NUMBER	ALT NO	BAROMETER	BARO
ALTERNATING CURRENT	AC	BARREL	BRL
ALUMINUM	AL	BASE BOARD RADIATION	BBR
AMBIENT	AMB	BASE LINE	BL
AMERICAN WIRE GAGE	AWG	BASE PLATE	BP
AMMETER	AMM	BASEBOARD	BB
AMOUNT	AMT	BASEMENT	BSMT

BATHROOM	B	CABLE TELEVISION	CTV
BATTERY	BAT	CADMIUM	CAD
BEAM	BM	CALIBRATE	CAL
BEARING	BRG	CANDLE POWER	CP
BEARING PLATE	BRG PL	CAPACITY	CAP
BED JOINT	BJT	CAPPED OUTLET	CO
BEDROOM	BR	CARBON DIOXIDE	CO2
BELL AND BELL	B&B	CARBON MONOXIDE	CO
BELL AND FLANGE	B&F	CARPET	CARP
BELL AND SPIGOT	B&S	CASED OPENING	CO
BELL END	BE	CASEMENT	CSMT
BELOW	BLW	CASEWORK	CSWK
BELOW CEILING	BLW CLG	CASING	CSG
BELOW FINISH FLOOR	BLW FFLR	CASING BEAD	CSB
BENCH MARK	BM	CAST IRON	CI
BEND RADIUS	BR	CAST IRON MECHANICAL JOINT	CIMJ
BETWEEN	BETW	CAST IRON PIPE	CIP
BEVEL	BEV	CAST IRON RADIATOR	CIR
BITUMINOUS	BITUM	CAST IRON SOIL PIPE	CISP
BLACK IRON	BI	CAST STEEL	CSTL
BLACK STEEL PIPE	BSP	CAST STONE	CS
BLOCK	BLK	CATALOG	CAT
BLOCKING	BLKG	CATCH BASIN	CB
BLOWDOWN	BLWDN	CAVITY	CAV
BLOWER	BLO	CEILING	CLG
BLOWOFF	BO	CEILING DIFFUSER	CLG DIFF
BOARD	BD	CEILING HEIGHT	CLG HT
BOILER	BLR	CEILING REGISTER	CLG REG
BOILER FEED BOOSTER PUMP	BFBP	CEMENT	CEM
BOILER FEED PUMP	BFP	CEMENT PLASTER	CEM PLAS
BOILER FEED WATER	BFW	CENTER LINE	CL
BOIL HORSEPOWER	BLR HP	CENTER TO CENTER	C/C
BOILING POINT	BP	CENTRIFUGAL	CNTFGL
BOLT CIRCLE	BC	CERAMIC	CER
BOOSTER	BSTR	CERAMIC TILE	CER TILE
BOTH FACES	BF	CHALKBOARD	CH BD
BOTH SIDES	BS	CHAMFER	CHFR
BOTH WAYS	BW	CHANNEL	CHAN
BOTTOM	BOT	CHECK	CHK
BOTTOM FACE	BF	CHECK VALVE	CHKV
BOTTOM OF BACKSLOPE	BBS	CHEMICAL	CHEM
BOTTOM OF FORESLOPE	BFS	CHEMICAL FEED PUMP	CFP
BOULEVARD	BLVD	CHILLED AND HEATING WATER RETURN	CHHWR
BRACING	BRCG	CHILLED AND HEATING WATER SUPPLY	CHHWS
BRACKET	BRKT	CHILLED WATER	CHW
BRAKE HORSEPOWER	BHP	CHILLED WATER PRIMARY PUMP	CHWPP
BRASS	BRs	CHILLED WATER PUMP	CHWP
BREAKER	BRKR	CHILLED WATER RECIRCULATING PUMP	CHWRP
BRICK	BRK	CHILLED WATER RETURN	CHWR
BRIDGING	BRDG	CHILLED WATER SECONDARY PUMP	CHWSP
BRIDGING JOIST	BRDG JST	CHILLED WATER SUPPLY	CHWS
BRITISH THERMAL UNIT	BTU	CHILLER	CH
BRITISH THERMAL UNIT(1000)	MBTU	CHLORINATED POLYVINYL CHLORIDE	CPVC
BRITISH THERMAL UNITS PER HOUR	BTUH	CHROME PLATED	CHR PL
BRONZE	BRZ	CIRCLE	CIR
BUILDING	BLDG	CIRCUIT	CKT
BUILT-UP	BU	CIRCUIT BREAKER	CKT BRKR
BUILT-UP ROOF	BUR	CIRCULAR	CIRC
BULKHEAD	BLKHD	CIRCULATING HOT WATER	CHW
BULLETIN BOARD	BB	CIRCULATING WATER PUMP	CWP
BURGLAR ALARM	BA	CIRCUMFERENCE	CRCMF
BUS DIFFERENTIAL CURRENT		CLAMP	CLMP
TRANSFORMER	BDCT	CLASSROOM	CLRM
BUSHING	BSHG	CLEANOUT	CO
BUSHING CURRENT TRANSFORMER	BCT	CLEAR	CLR
BUSHING POTENTIAL DEVICE	BPD	CLOCKWISE	CW
BUTTERFLY	BTFL	CLOSED CIRCUIT TELEVISION	CCTV
BUTTERFLY CHECK VALVE	CV	CLOSET	CLO
BUTTERFLY VALVE	BFV	CLOSING COIL	CC
CABINET	CAB	CLOSURE	CLS
CABINET HEATER	CAB H	COAGULANT	COAG
CABINET UNIT HEATER	CUH	COAXIAL CABLE	COAX

COEFFICIENT	COEF	CUBICLE	CUB
COEFFICIENT OF PERFORMANCE	COP	CURB AND GUTTER	C&G
COLD ROLLED STEEL	CRS	CURRENT	CUR
COLD WATER	CW	CURRENT TRANSFORMER CABINET	CTC
COLUMN	COL	CURRENT TRANSFORMER	CT
COLUMN LINE	CLL	CYCLE	CY
COMBINATION	COMB	CYLINDER	CYL
COMBINATION TOWEL DISPENSER		CYLINDER LOCK	CYL L
& RECEPTACLE	CTD&R	DAMPER	DMPR
COMBUSTION	CBSN	DAMPPOOFING	DMPF
COMMON	COM	DATUM	DAT
COMMUNICATION	COMM	DEAD LEAD	DL
COMPARTMENT	COMPT	DEAD SOFT ANNEALED	DSA
COMPLETE	COMPL	DEIONIZED WATER	DIW
COMPOSITE	CMPST	DELUXE WHITE	DW
COMPRESSIBLE	CPRS	DEMAND METER	DM
COMPRESSOR	CPRSR	DEMOLITION	DEMO
CONCENTRIC REDUCER	CR	DEPARTMENT	DEPT
CONCRETE	CONC	DETAIL	DET
CONCRETE EQUIPMENT BASE	CEB	DETECTOR	DET
CONCRETE FLOOR	CONC FL	DEW POINT	DP
CONCRETE MASONRY UNIT	CMU	DIAMETER BOLT CIRCLE	DBC
CONCRETE PIPE	CP	DIESEL FUEL	DF
CONCRETE PIPE ARCH	CPA	DIFFERENCE	DIFF
CONCRETE SEWER PIPE	CSP	DIFFUSER	DIFF
CONCRETE SPLASH BLOCK	CSB	DIMENSION	DIM
CONDENSATE RETURN PUMP	CRP	DIMMER CONTROL PANEL	DCP
CONDENSER WATER PUMP	CWP	DINING ROOM	DR
CONDENSER WATER RETURN	CWR	DIRECT CONNECTION	DIR CONN
CONDENSER WATER SUPPLY	CWS	DIRECT CURRENT	DC
CONDENSER (ATE)	COND	DIRECT EXPANSION	DX
CONDUCTORS, NUMBER OF (3)	3/C	DIRECT RADIATION	DIR RADN
CONDUIT	CND	DISHWASHER	DW
CONFERENCE	CONF	DISPENSER	DISP
CONNECTION	CONN	DISTANCE	DIST
CONSTRUCTION	CONSTR	DISTILLED WATER	DW
CONSTRUCTION JOINT	CJ	DISTRIBUTE (ION)	DISTR
CONTINUOUS (ATION)	CONT	DISTRIBUTION PANEL	DISTR PNL
CONTRACT(OR)	CONTR	DITTO	DO
CONTRACT LIMIT LINE	CLL	DIVIDER	DIV
CONTRACTOR FURNISHED EQUIP.	CFE	DIVISION	DIV
CONTROL JOINT	CLJ	DOMESTIC WATER CONDITIONER	DWC
CONTROL PANEL	CP	DOMESTIC WATER HEATER	DWH
CONTROL RELAY	CR	DOOR CLOSURE	DCL
CONTROL SWITCH	CS	DOOR FRAME	DFR
CONTROL VALVE	CV	DOOR LOUVER	DLV
CONVECTOR	CONV	DOOR OPENING	DOP
COOL WHITE	CW	DOOR STOP	DST
COOL WHITE DELUXE	CWX	DOUBLE ACTING	DBL ACT
COOLING TOWER	CT	DOUBLE GLAZING	DBL GLZ
COOLING TOWER RETURN	CTR	DOUBLE HUNG	DH
COOLING TOWER SUPPLY	CTS	DOUBLE JOIST	DJ
COORDINATE	COORD	DOUBLE POLE, DOUBLE THROW	DPDT
CORNER	CNR	DOUBLE POLE, SINGLE THROW	DPST
CORNER BEAD	CB	DOVETAIL	DVTL
CORNER GUARD	CD	DOWEL	DWL
CORRECTION FACTOR	CORR FAC	DOWN	DN
CORRIDOR	CORR	DOWNSPOUT	DS
CORRUGATED METAL PIPE	CMP	DRAIN	DR
COUNTER	CNTR	DRAIN TILE	DT
COUNTER CLOCKWISE	CCW	DRAIN VALVE	DV
COUNTER FLASHING	CFLG	DRAIN WASTE & VENT	DWV
COUNTERBORE	CBORE	DRAINAGE AREA	DA
COUNTER SUNK	CSK	DRAWER	DWR
COUPLING	CPLG	DRAWING	DWG
COUPLING CAPACITOR		DRINKING FOUNTAIN	DF
POTENTIAL DEVICE	CCPD	DRINKING WATER RETURN	DWR
COVER	COV	DRINKING WATER SUPPLY	DWS
COVER PLATE	COV PL	DRIVE	DR
CROSS ARM	X ARM	DROP MANHOLE	DMH
CROSS SECTION	X SECT	DRY BULB	DB
CROWN	CRN	DRY STANDPIPE	DSP

DRY WELL	DRW	EXISTING	EXST
DUCT ACCESS PANEL	DAP	EXISTING GRADE	EXST GR
DUCT COVERING INSULATION	DCI	EXPANSION	EXP
DUCT LINER INSULATION	DLI	EXPANSION BOLT	EXP BT
DUCTILE IRON PIPE	DIP	EXPANSION JOINT	EXP JT
DUMBWAITER	DWTR	EXPANSION TANK	EXP TK
DUPLEX	DX	EXPLOSION PROOF	EPRF
DUPLICATE	DUPL	EXTENSION	EXTN
DUST TIGHT	DT	EXTERIOR	EXT
EACH FACE	EF	EXTRUSION	EXTR
EACH WAY	EW	FABRIC WALL COVERING	FWC
EASEMENT	ESMT	FACE OF CONCRETE	FOC
EASEMENT LINE	EL	FACE OF FINISH	FOF
EAST	E	FACE OF MASONRY	FOM
ECCENTRIC REDUCER	ECC RDCR	FACE OF STUDS	FOS
ECCENTRIC	ECC	FACE TO FACE	F/F
ECONOMIZER	ECON	FACTOR	FAC
EDGE OF PAVEMENT	EP	FACTORY WIRED PANEL	FWP
EDGE OF SHOULDER	ES	FAN COIL UNIT	FCU
EFFECTIVE TEMPERATURE	ET	FAR FACE	FF
EFFLUENT	EFL	FAR SIDE	FS
ELASTOMERIC	ELAST	FASTENER	FSTNR
ELBOW	ELB	FEEDER	FDR
ELECTRICAL	ELEC	FEEDWATER	FDW
ELECTRICAL CABINET	ECAB	FEETBOARD MEASURE	FBM
ELECTRICAL HAND DRYER	EHD	FEET PER MINUTE	FPM
ELECTRICAL HEATING PANEL	EHP	FEET PER SECOND	FPS
ELECTRICAL METALIC TUBING	EMT	FEMALE	FEM
ELECTRICAL OUTLET	EO	FEMALE PIPE THREAD	FPT
ELECTRICAL PANEL	EP	FENCE	FN
ELECTRICAL WATER COOLER	EW	FIBERBOARD	FBD
ELECTRICAL WATER HEATER	EW	FIBERGLASS	FGL
ELECTRO-HYDRAULIC CONTROL	EHC	FILTER	FLTR
ELECTROMOTIVE FORCE	EMF	FINISH	FIN
ELEVATION	EL	FINISH FLOOR	FIN FL
ELEVATOR	ELEV	FINISH GRADE	FIN GR
EMERGENCY	EMER	FINNED TUBE CONVECTOR	FTC
EMERGENCY SHOWER	EMER SHR	FINNED TUBE RADIATION	FTR
EMERGENCY SWITCH PANEL	ESP	FIRE ALARM	FA
ENAMEL	ENAM	FIRE ALARM CONTROL PANEL	FACP
ENCLOSURE	ENCL	FIRE BLANKET	FB
ENERGY	ENGY	FIRE BRICK	F BRK
ENGINE	ENG	FIRE DAMPER	FDMPR
ENGINEER	ENGR	FIRE DEPARTMENT CONNECTION	FDC
ENTERING AIR TEMPERATURE	EAT	FIRE DEPARTMENT CONNECTION	
ENTERING DRY BULB TEMPERATURE	EDBT	CABINET	FDCC
ENTERING WATER TEMPERATURE	EW	FIRE DEPARTMENT VALVE	FDV
ENTERING WET BULB TEMPERATURE	EWBT	FIRE EXTINGUISHER	FEXT
ENTRANCE	ENTR	FIRE EXTINGUISHER CABINET	FEC
EQUALLY SPACED	EQL SP	FIRE HOSE CABINET	FHC
EQUIPMENT	EQUIP	FIRE HOSE RACK	FHR
EQUIPMENT DRAIN	EDR	FIRE HYDRANT	FHY
EQUIVALENT	EQUIV	FIRE PROTECTION WATER SUPPLY	FPW
EQUIVALENT DIRECT RADIATION	EDR	FIRE RATING	FR
ERECTION	ERECT	FIRE SPRINKLER HEAD	FSH
ESCALATOR	ESCAL	FIRE STANDPIPE	FSP
ESTIMATE	EST	FIRE WATER PUMP	FWP
		FIREPLACE	FPL
ETHYLENE PROPYLENE DIENE		FIREPROOFING	FPRF
MONOMER	EPDM	FITTING	FTG
EVAPORATE	EVAP	FIXTURE	FXTR
EVAPORATIVE COOLING UNIT	ECU	FLANGE	FLG
EXCAVATE	EXC	FLARED	FLRD
EXCHANGER	EXCH	FLARED TUBE FITTING	FTF
EXCITER	EXCTR	FLASHING	FL
EXHAUST	EXH	FLAT BAR	FB
EXHAUST AIR	EXH A	FLAT BOTTOM DITCH	FBD
EXHAUST DUCT	EXH DT	FLAT HEAD MACHINE SCREW	FHMS
EXHAUST FAN	EXH FN	FLAT HEAD WOOD SCREW	FHWS
EXHAUST GRILLE	EXH GR	FLEXIBLE CONNECTION	FLEX C
EXHAUST HOOD	EXH HD	FLOAT AND THERMOSTATIC TRAP	F&TT
EXHAUST REGISTER	EXH RG	FLOAT GLASS	FLT GL

FLOCCULATOR	FLOC	GLASS BLOCK	GL BLK
FLOOR (ING)	FLR	GLAZED CONCRETE MASONRY UNIT	GLZ CMU
FLOOR CLEANOUT	FCO	GLAZING	GLZ
FLOOR DRAIN	FD	GLOBE VALVE	GLV
FLOOR FINISH	FLR FIN	GLUE LAMINATED	GLU LAM
FLOOR PLATE	FLR PL	GOOD FOUR SIDES	G4S
FLOOR REGISTER	FLR REG	GOOD ONE SIDE	G1S
FLOOR SINK	FLR SK	GOOD THREE SIDES	G3S
FLOW LINE	FLL	GOOD TWO SIDES	G2S
FLOW MEASURING DEVICE	FMD	GOOSENECK	GSNK
FLOW SENSING SWITCH	FSS	GOVERNMENT	GOVT
FLOW SWITCH	FLSW	GRAB BAR	GB
FLUID	FLD	GRAD (E) (ING)	GR
FLUORESCENT	FLUOR	GRADE BEAM	GR BM
FLUSHING RIM SINK	FR SNK	GRADE CLEANOUT	GCO
FOLDING	FLDG	GRADE LINE	GR LN
FOOT VALVE	FV	GRAND MASTER KEYED	GMKD
FOOTCANDLE	FC	GRATING	GRTG
FOOTING	FTG	GRAVEL	GVL
FOOTLAMBERT	FL	GRAVITY (CONSTANT)	G
FORMBOARD	FMBD	GRAVITY ROOF VENTILATOR	GRV
FOUNDATION	FDN	GRAVITY VENT	GV
FRAME	FR	GREASE TRAP	GT
FRAMED MIRROR	FR MIR	GRILLE	GRL
FRAMED MIRROR AND SHELF	FR MIR/SHF	GROUND	GND
FREEZESTAT	FSTAT	GROUND FAULT INTERRUPTER	GFI
FREEZING POINT	FP	GROUT	GT
FREQUENCY	FREQ	GUARD RAIL	GDR
FREQUENCY MODULATION	FM	GUTTER	GUT
FRICTION FACTOR	FRIC FAC	GUTTER DRAIN	GD
FROG	FG	GYPSUM	GYP
FROM FLOOR ABOVE	FFA	GYPSUM BOARD	GYP BD
FROM FLOOR BELOW	FFB	GYPSUM PLASTER	GYP PLAS
FRONT	FRT	HAND DRYER	HD
FUEL OIL	FO	HAND RAIL	HNDRL
FUEL OIL RETURN	FOR	HAND-OFF-AUTO	HOA
FUEL OIL SUPPLY	FOS	HANDHOLE	HH
FUEL OIL VENT	FOV	HANDWHEEL	HNDWL
FULL HEIGHT PARTITION	FHP	HANGER	HGR
FULL LOAD AMPS	FLA	HARDBOARD	HDBD
FULL SIZE	FS	HARDWARE	HDWE
FULL VOLTAGE NON-REVERSING	FVNR	HARDWOOD	HDWD
FURNACE	FUR	HEAD	HD
FURNITURE	FURN	HEAD JOINT	HD JT
FURRING	FURR	HEADER	HDR
FUSE	FU	HEADWALL	HDWL
FUSED SWITCH	FU SW	HEAT	HT
FUTURE	FUT	HEAT ABSORBING GLASS	HAGL
GAGE	GA	HEAT EXCHANGER	HEX
GALLON	GAL	HEAT GAIN	HG
GALLONS PER DAY	GPD	HEAT RECOVERY UNIT	HRU
GALLONS PER HOUR	GPH	HEAT TRANSFER COEFFICIENT	U
GALLONS PER MINUTE	GPM	HEATER	HTR
GALLONS PER SECOND	GPS	HEATING	HTG
GALVANIZED	GALV	HEATING COIL	HC
GALVANIZED IRON	GALVI	HEATING WATER RETURN	HTWR
GALVANIZED IRON PIPE	GIP	HEATING WATER SUPPLY	HTWS
GALVANIZED STEEL	GALVS	HEATING, VENTILATION, AIR	
GAS	G	CONDITIONING	HVAC
GAS (OLINE) VENT	GV	HEAVY	HVY
GAS PRESSURE REGULATOR	GPR	HEAVY DUTY	HD
GAS VENT THROUGH ROOF	GVTR	HEIGHT	HGT
GAS WATER HEATER	GWH	HERTZ	HZ
GASKET	GSKT	HEXAGONAL	HEX
GASOLINE, NON-LEADED	NLG	HIGH	H
GASOLINE, PREMIUM	PG	HIGH FREQUENCY	HF
GASOLINE, REGULAR	RG	HIGH INTENSITY DISCHARGE	HID
GATE VALVE	GTV	HIGH OUTPUT	HO
GENERAL	GENL	HIGH POINT	HPT
GENERAL CONTRACT	GENL CONTR	HIGH POWER FACTOR	HPF
GENERATOR	GEN	HIGH PRESSURE	HP
GLASS	GL	HIGH PRESSURE BOILER	HPB



HIGH PRESSURE DRIP TRAP	HPDT	IRRIGATION WATER	IW
HIGH PRESSURE GAS	HPG	ISOMETRIC	ISO
HIGH PRESSURE LAMINATE	H PLAM	JANITOR	JAN
HIGH PRESSURE RETURN	HPR	JANITOR'S CLOSET	JC
HIGH PRESSURE STEAM	HPS	JOINT	JT
HIGH PRESSURE TRAP	HPT	JOIST	JST
HIGH STRENGTH	HS	JOULE	J
HIGH STRENGTH BOLT	HSB	JUNCTION	JCT
HIGH VELOCITY DIFFUSER	HVD	JUNCTION BOX	JB
HIGH VELOCITY TERMINAL	HVT	JUNIOR	JR
HIGHWAY	HWY	KEENE'S CEMENT PLASTER	KCP
HOLD-OPEN	HO	KELVIN	K
HOLLOW CONCRETE MASONRY UNIT	HCMU	KEYWAY	KWY
HOLLOW CORE	HC	KICK PLATE	KPL
HOLLOW METAL	HM	KILN DRIED	KD
HOLLOW METAL DOOR	HMD	KILOVAR (REACTANCE)	KVAR
HOLLOW METAL FRAME	HMF	KILOVOLT	KV
HORIZONTAL	HORIZ	KILOVOLT AMPERE	KVA
HORSEPOWER	HP	KILOWATT	KW
HOSE BIBB	HB	KILOWATT HOUR	KWH
HOSE CABINET	HC	KIP (1000 LB)	K
HOSE GATE VALVE	HGV	KIPS PER LINEAR FOOT	KLF
HOSE VALVE	HV	KIPS PER SQUARE FOOT	KSF
HOT AND COLD WATER	H&CW	KIPS PER SQUARE INCH	KSI
HOT WATER	HW	KITCHEN	KIT
HOT WATER BOILER	HWB	KNEE BRACE	KB
HOT WATER CIRCULATION PUMP	HWCP	KNOCK DOWN	KD
HOT WATER COIL	HWC	KNOCKOUT	KO
HOT WATER HEATER	HWH	KNOCKOUT PANEL	KOP
HOT WATER PUMP	HWP	LABEL	LBL
HOT WATER RETURN	HWR	LABORATORY	LAB
HOT WATER SUPPLY	HWS	LADDER	LAD
HOT WATER TANK	HWT	LAMINATION	LAM
HOT WATER, CIRCULATING	HWC	LANDING	LDG
HOUR	HR	LARGE	LRG
HUMIDSTAT	HSTAT	LATENT HEAT	LH
HYDRANT	HYD	LATENT HEAT GAIN	LHG
HYDRAULIC	HYDR	LATENT HEAT RATIO	LHR
IDENTIFICATION	ID	LATERAL	LATL
IGNITION	IGN	LAUNDRY	LAU
ILLUMINATION	ILLUM	LAVATORY	LAV
INCANDESCENT	INCAND	LAWN SPRINKLING	LS
INCHES (WATER COLUMN)	IN WC	LEADER	LDR
INCINERATOR	INCIN	LEAST MEAN TEMP DIFFERENCE	LMTD
INDICATED HORSEPOWER	IHP	LEAST TEMP DIFFERENCE	LTD
INDICATOR	IND	LEAVING AIR	LA
INDIRECT WASTE	IW	LEAVING AIR TEMPERATURE	LAT
INDUSTRIAL	INDL	LEAVING DRY BULB TEMPERATURE	LDBT
INFLUENT	INF	LEAVING WATER TEMPERATURE	LWT
INLET	INL	LEAVING WET BULB TEMPERATURE	LWBT
INLET MANHOLE	IMH	LEFT	L
INSIDE DIAMETER	ID	LEFT HAND	LH
INSIDE FACE	IF	LEFT HAND REVERSE	LHR
INSIDE PIPE SIZE	IPS	LENGTH	LG
INSTALLATION	INSTL	LEVEL (ER)	LVL
INSTANTANEOUS WATER HEATER	IHWH	LEVER	LVR
INSTRUMENT	INSTR	LIBRARY	LIB
INSULATED PANEL	INSUL PNL	LIFT CHECK VALVE	LCV
INSULATION	INSUL	LIGHT	LT
INTAKE FAN	IF	LIGHT POLE	LP
INTERCOMMUNICATION	INTERCOM	LIGHTING	LTG
INTERIOR	INTR	LIGHTING PANEL	LTG PNL
INTERIOR TELEPHONE CABINET	ITC	LIGHTPROOF	LP
INTERIOR TELEPHONE TERMINAL BOARD	ITTB	LIGHTWEIGHT	LT WT
INTERLOCK	INTLK	LIGHTWEIGHT CONCRETE	LWC
INTERNATIONAL PIPE STANDARD	IPS	LIGHTWEIGHT CONCRETE	
INTERRUPTING CAPACITY	IC	MASONRY UNIT	LCMU
INVERT	INV	LIGHTWEIGHT PLASTER	LW PLAS
INVERT ELEVATION	INV EL	LIMIT SWITCH	LIM SW
IRON PIPE	IP	LINE-BUS	L-B
IRON PIPE SIZE	IPS	LINE-GROUND	L-G
IRON PIPE THREAD	IPT	LINEAR	LIN

LINEAR CEILING DIFFUSER	LCD	MEDIUM PRESSURE RETURN	MPR
LINEAR DIFFUSER	LD	MEDIUM PRESSURE STEAM	MPS
LINEAR FOOT	LF	MEETING	MTG
LINTEL	LNTL	MEGAVOLT	MV
LIQUEFIED PETROLEUM	LP	MEGAVOLT-AMPERES	MVA
LIQUID	LIQ	MEGAWATT	MW
LIQUIFIED PETROLEUM GAS	LPG	MEMBER	MBR
LIVE LOAD	LL	MEMBRANE	MEMB
LIVING ROOM	LR	MERCURY	HG
LOAD BEARING	LD BRG	METAL	MET
LOCATION	LOC	METAL BASE	METB
LOCKED ROTOR	LKROT	METAL LATH	ML
LOCKED ROTOR AMPS	LRA	METER	M
LOCKER	LKR	MEZZANINE	MEZZ
LOCKER ROOM	LKR RM	MID-ORDINATE	MO
LONG LEG HORIZONTAL	LLH	MILE	MI
LONG LEG VERTICAL	LLV	MILES PER HOUR	MPH
LONGITUDINAL	LONG	MILLIAMPERE	MA
LOUDSPEAKER	LS	MILLION GALLONS PER DAY	MGD
LOUVER	LVR	MILLWORK	MLWK
LOUVERED ROOF VENT	LRV	MINIMUM	MIN
LOW POINT	LPT	MINUTE	MIN
LOW PRESSURE	LP	MIRROR	MIR
LOW PRESSURE ALARM SWITCH	LPAS	MISCELLANEOUS	MISC
LOW PRESSURE BOILER	LPB	MIXED AIR	MA
LOW PRESSURE CONDENSATE		MIXED AIR TEMPERATURE	MAT
RETURN	LPCR	MIXING BOX	MB
LOW PRESSURE DRIP TRAP SET	LPDT	MOBILIZATION MOBIL MODULE (AR)	MOD
LOW PRESSURE RETURN	LPR	MOLDING	MLDG
LOW PRESSURE STEAM	LPS	MOMENT CONNECTION	MC
LOW VOLTAGE	LV	MOMENTARY CONTACT	MC
LOW WATER CUT OFF	LWCO	MONITOR	MON
LUBRICATE	LUB	MONUMENT	MON
LUBRICATED PLUG VALVE	LPV	MOP SERVICE BASIN	MSB
LUBRICATING OIL	LO	MOP/BROOM HOLDER	MBH
LUBRICATING OIL VENT	LOV	MORTAR	MTR
LUMBER	LBR	MOTOR	MOT
LUMENTS PER WATT	LPW	MOTOR CONTROL CENTER	MCC
LUMP SUM	LS	MOTOR GENERATOR	MG
MACHINE	MACH	MOTOR OPERATED DAMPER	MOD
MACHINE ROOM	MACH RM	MOTOR OPERATED VALVE	MOV
MAGNETIC STARTER	MAG ST	MOTOR STARTER	MS
MAINTENANCE	MAINT	MOTOR STARTER PANEL	MSP
MAKE-UP AIR UNIT	MAU	MOTOR STARTER SWITCH	MSS
MALE PIPE THREAD	MPT	MOUNTED	MTD
MALLEABLE IRON	MI	MOUNTING	MTG
MANHOLE	MH	MOVABLE	MVBL
MANUAL	MAN	MULLION	MULL
MANUAL DAMPER	MD	MULTI-ZONE	MZ
MANUAL TRANSFER SWITCH	MTS	MULTIPLE	MULT
MANUAL VOLUME DAMPER	MVD	NAMEPLATE	NPL
MANUFACTURING	MFG	NATIONAL COARSE (THREAD)	NC
MARBLE	MARB	NATIONAL FINE (THREAD)	NF
MARK	MK	NATIONAL PIPE THREAD	NPF
MARKER	MKR	NATIONAL TAPER PIPE (THREAD)	NPT
MASONRY	MAS	NATURAL	NAT
MASONRY OPENING	MO	NEAR FACE	NF
MASTER ANTENNA TELEVISION SYSTEM	MATV	NEAR SIDE	NS
MASTER BEDROOM	MBR	NEGATIVE	NEG
MATERIAL	MATL	NEUTRAL	NEUT
MAXIMUM	MAX	NICKEL	NKL
MAXIMUM WORKING PRESSURE	MWP	NIPPLE	NIP
MEAN EFFECTIVE TEMPERATURE	MET	NITROGEN	N
MEAN HIGH TIDE	MHT	NO PAINT	NP
MEAN LOW TIDE	MLT	NO VOLTAGE RELEASE	NVR
MEAN TEMPERATURE DIFFERENCE	MTD	NOISE CRITERIA	NC
MECHANICAL	MECH	NOISE REDUCTION	NR
MECHANICAL JOINT	MJ	NOISE REDUCTION COEFFICIENT	NRC
MEDICINE CABINET	MC	NOMINAL	NOM
MEDIUM	MED	NON REINFORCED CONCRETE PIPE	NRCP
MEDIUM DENSITY OVERLAID	MDO	NON-RISING STEM	NRS
MEDIUM PRESSURE	MP	NONFUSED	NFSD

NORMALLY CLOSED	NC	PLASTER	PLAS
NORMALLY OPEN	NO	PLASTIC LAMINATE	PLAM
NORTH	N	PLATE	PL
NOT APPLICABLE	NA	PLATFORM	PLAT
NOT IN CONTRACT	NIC	PLUG COCK	PC
NOT TO SCALE	NTS	PLUGGED TEE	PT
NOZZLE	NOZ	PLUMBING	PLBG
NUMBER	NO	PLYWOOD	PLYWD
OBSCURE	OBS	PNEUMATIC	PNEU
OFFICE	OFF	POINT OF COMPOUND CURVE	PCC
OIL CIRCUIT BREAKER	OCB	POINT OF CURVE	PC
OIL CIRCUIT RECLOSURE	OCR	POINT OF FROG	PF
ON CENTER	OC	POINT OF INTERSECTION	PI
ONE THOUSAND FOOT POUNDS	KIP FT	POINT OF INTERSECTION FOR	
ONE THOUSAND GALLONS PER HOUR	MGPH	VERTICAL CURVE	PIVC
OPENING	OPNG	POINT OF REVERSE CURVE	PRC
OPPOSITE	OPP	POINT OF REVERSE CURVE	
OPTIONAL	OPT	VERTICAL CURVE	PRCVC
ORIFICE	ORF	POINT OF SPIRAL TANGENT	PST
ORIGINAL	ORIG	POINT OF SWITCH	PS
OUNCE	OZ	POINT OF TANGENCY	PVT
OUT TO OUT	O/O	POINT OF VERTICAL CURVE	PVC
OUTLET VELOCITY	OV	POINT OF VERTICAL INTERSECTION	PVI
OUTSIDE AIR	OA	POINT OF VERTICAL TANGENCY	PVT
OUTSIDE AIR DAMPER	OAD	POLE	P
OUTSIDE DIAMETER	OD	POLISHED	POL
OUTSIDE DIMENSION	OD	POLYETHYLENE	PE
OUTSIDE FACE	OF	POLYVINYL CHLORIDE	PVC
OVER CURRENT	OVC	POLYVINYLDINE FLUORIDE	PVF
OVERALL	OA	PORTABLE	PORT
OVERFLOW	OVFL	PORTLAND CEMENT	PC
OVERFLOW ROOF DRAIN	ORD	PORTLAND CEMENT PLASTER	PCP
OVERHEAD	OVHD	POSITIVE	POS
OVERHEAD GUY WIRE	OHGW	POST INDICATOR VALVE	PIV
OWNER FURNISHED-CONTRACTOR		POUND	LB
INSTALLED	OFCI	POUNDS PER CUBIC FOOT	PCF
OWNER FURNISHED-OWNER INSTALLED	OFOI	POUNDS PER LINEAR FOOT	PLF
OXYGEN	OXY	POUNDS PER SQUARE FOOT	PSF
PACKAGE	PKG	POUNDS PER SQUARE INCH	PSI
PAINT	PNT	POUNDS PER SQUARE INCH ABSOLUTE	PSIA
PAINTED	PTD	POUNDS PER SQUARE INCH GAGE	PSIG
PAIR	PR	POWER	PWR
PANEL	PNL	POWER FACTOR	PF
PANIC BAR	PB	POWER PANEL	PP
PAPER CUP DISPENSER	PCD	POWER ROOF EXHAUSTER	PRE
PAPER TOWEL DISPENSER	PTD	POWER ROOF VENTILATOR	PRV
PAPER TOWEL RECEPTACLE	PTR	POWER WALL EXHAUSTER	PWE
PARALLEL	PAR	PRECAST	PRCST
PARGING	PARG	PREFABRICATED	PREFAB
PARKING	PARKG	PREFINISHED	PREFIN
PARKWAY	PKWY	PRELIMINARY	PRELIM
PARTICLEBOARD	PBD	PREPARATION	PREP
PARTITION	PTN	PRESSURE GAGE	PG
PARTS PER MILLION	PPM	PRESSURE REDUCING VALVE	PRV
PATENT	PAT	PRESSURE RELIEF VALVE	PRV
PAVED	PV	PRESSURE SWITCH	PRESS SW
PAVEMENT	PVMT	PRESSURE TEMPERATURE RELIEF VALVE	PTRV
PAVING	PVG	PRESTRESSED CONCRETE	PS CONC
PEDESTAL	PED	PRIMARY	PRI
PEGBOARD	PGBD	PROJECT	PROJ
PERFORATED	PERF	PROPERTY	PROP
PERIMETER	PERIM	PROPERTY LINE	PL
PERMANENT	PERM	PUBLIC ADDRESS	PA
PERPENDICULAR	PERP	PULL BOX	PB
PETCOCK	PC	PULL CHAIN	PC
PHASE	PH	PUMP	P
PHILLIP'S HEAD SCREW	PHS	PUMP DISCHARGE LINE	PD
PHOTOGRAPH	PHOTO	PUMPED RETURN	PR
PIECE	PC	PURSE SHELF	PSH
PIPE ANCHOR	PA	PUSHBUTTON	PB
PIPE GUIDE	PG	QUALITY	QUAL
PIPE TAP	PT	QUANTITY	QTY

QUARRY TILE	QT	SAFETY FACTOR	SF
QUARTER	QTR	SAFETY VALVE	SV
QUICK COUPLER VALVE	QCV	SALVAGE	SALV
RADIATION	RADN	SANITARY	SAN
RADIO FREQUENCY	RF	SANITARY NAPKIN DISPENSER	SND
RADIUS	RAD	SANITARY NAPKIN RECEPTACLE	SNR
RAILING	RLG	SANITARY SEWER	SS
RAILROAD	RR	SANITARY VENT	V
RAIN WATER CONDUCTOR	RWC	SATURATION	SAT
RAIN WATER LEADER	RWL	SCHEDULE	SCHED
RAISED FACE	RF	SCORED JOINT	SJ
RAPID START	RS	SCREEN	SCRN
REACTIVE KILOVOLT AMPERES	RKVA	SEAMLESS	SMLS
RECEIVED	RECD	SECOND	SEC
RECEIVER	RCVR	SECTION	SECT
RECEPTACLE	RECPT	SEGMENT	SEG
RECESSED	REC	SENSIBLE HEAT	SH
RECESSED HOSE BIBB	RHB	SENSIBLE HEAT GAIN	SHG
RECIRCULATE	RECIRC	SENSIBLE HEAT RATIO	SHR
RECTANGULAR	RECT	SERVICE	SVCE
REDUCER	RDC	SERVICE RECEPTOR	SR
REFERENCE	REF	SERVICE SINK	SSK
REFLECTOR	REFL	SEWER	SWR
REFRIGERANT	RFGT	SHEATHING	SHTHG
REFRIGERANT DISCHARGE	RD	SHEET (ING)	SHT
REFRIGERANT HOT GAS	RHG	SHEET METAL	SM
REFRIGERANT LIQUID	RL	SHELVES (ING)	SHV
REFRIGERANT LIQUID LINE	RLL	SHOCK ABSORBER	SA
REFRIGERANT SUCTION	RS	SHOULDER	SHLDR
REFRIGERANT SUCTION LINE	RSL	SHOWER	SHR
REFRIGERATION	REFR	SIDEWALK	SW
REGISTER	REG	SIDEWATER DEPTH	SWD
REGULATOR	RGLTR	SIGNAL	SIG
REHEAT COIL	RHC	SIMILAR	SIM
REINFORCE (D) (ING) (MENT)	REINF	SINGLE	SGL
REINFORCED CONCRETE	RC	SINGLE POLE	SP
REINFORCED CONCRETE BOX	RCB	SINGLE POLE, DOUBLE THROW	SPDT
REINFORCED CONCRETE PIPE	RCP	SINGLE POLE, SINGLE THROW	SPST
RELATIVE HUMIDITY	RH	SINK	SK
RELIEF	RLF	SLEEVE	SLV
RELIEF VALVE	RV	SLIDE (ING)	SL
REMOTE CONTROL	RC	SLIP JOINT	SJ
REMOVABLE	REM	SLOPE	SLP
REPRODUCE	REPRO	SMOKE DAMPER	SDMPR
REQUIRED	REQD	SMOOTH	SM
RESILIENT	RESIL	SOAP DISPENSER	SD
RETURN	RET	SOIL PIPE	SP
RETURN AIR	RA	SOLENOID VALVE	SOLV
RETURN AIR FAN	RA FAN	SOLID CONCRETE MASONRY UNIT	SCMU
RETURN AIR GRILLE	RA GR	SOLID CORE	SC
REVERSE	RVS	SOOT BLOWER	SB
REVOLUTIONS PER MINUTE	RPM	SOUND TRANSMISSION CLASS	STC
REVOLUTIONS PER SECOND	RPS	SOUTH	S
RIGHT HAND	RH	SPACE (ING)	SP
RIGHT HAND REVERSE	RHR	SPEAKER	SPKR
RIGHT OF WAY	ROW	SPECIAL	SPCL
RISER	R	SPECIFIC	SP
RIVETED	RVT	SPECIFIC GRAVITY	SP GR
ROAD	RD	SPECIFIC HEAT	SP HT
ROOF DRAIN	RD	SPECIFIC VOLUME	SP VOL
ROOF VENT	RV	SPECIFICATION	SPEC
ROOF VENTILATOR	RV	SPLASH BLOCK	SB
ROOTING	RFG	SPLIT TEE	SPT
ROOM	RM	SPLITTER DAMPER	SPD
ROUGH OPENING	RO	SPRINKLER	SPKLR
ROUND	RND	SQUARE	SQ
ROUND HEAD MACHINE SCREW	RHMS	SQUARE FOOT	SQ FT
ROUND HEAD WOOD SCREW	RHWS	SQUARE INCH	SQ IN
RUBBER	RBR	SQUARE KILOMETER	SQ KM
RUNWAY	RWY	SQUARE METER	SQ M
SADDLE	SDL	SQUARE MILLIMETER	SQ MM
SAFE WORKING PRESSURE	SWP	SQUARE YARD	SQ YD

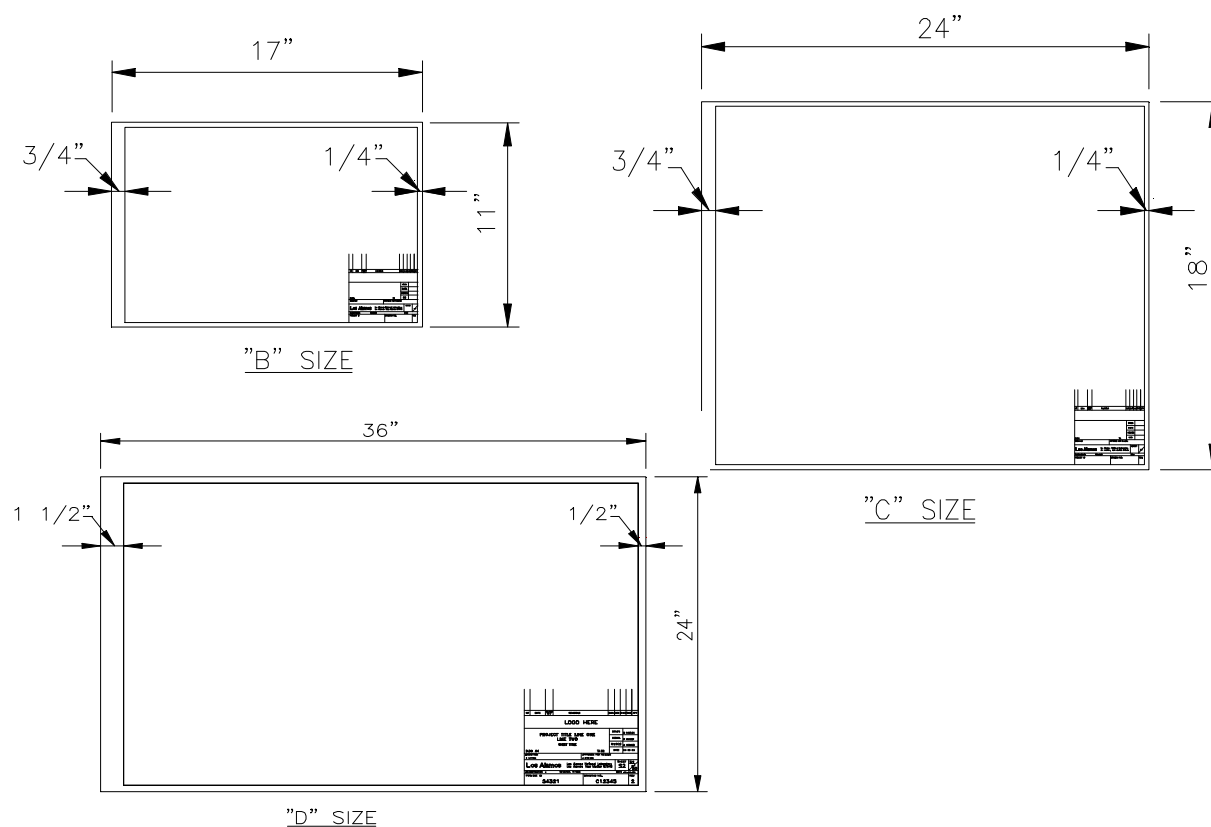
STAGGERED	STAG	TERRAZZO	TER
STAINLESS STEEL	SST	TEST BORING-xx(e.g. TB-1)	TBxx
STAKE	STK	THERMAL	THERM
STANDARD	STD	THERMAL OVERLOAD	TOL
STANDPIPE	SP	THERMAL RESISTANCE	R
STATIC PRESSURE	ST PR	THERMOCOUPLE	TC
STATION	STA	THERMOSTAT	T
STEAM	STM	THERMOSTATIC MIXING VALVE	TMV
STEAM GAGE	SG	THERMOSTATIC TRAP	TT
STEAM MANHOLE	SMH	THICKNESS	THK
STEAM RETURN	SR	THOUSAND BOARD FEET	MBF
STEAM SUPPLY	SS	THOUSAND BTU PER HOUR	MBH
STEAM WORKING PRESSURE	STWP	THOUSAND CIRCULAR MILS	MCM
STEEL	STL	THOUSAND CUBIC FEET	MCF
STEEL JOIST	STL JST	THOUSAND CUBIC FEET PER MINUTE	MCFM
STEEL PLATE	STL PL	THREAD (ED)	THD
STIFFENER	STIF	THREADED BOTH ENDS	TBE
STIRRUP	STIR	THREADED ONE END	TOE
STORAGE	STOR	THRESHOLD	THRES
STORM DRAIN	SD	THROUGH	THRU
STORM DRAIN MANHOLE	SDMH	TO FLOOR ABOVE	TFA
STRAIGHT	STR	TO FLOOR BELOW	TFB
STRAINER	STN	TOILET PAPER HOLDER	TPH
STREET	ST	TOLERANCE	TOL
STRUCTURAL	STRUCT	TONGUE AND GROOVE	T&G
STRUCTURAL CLAY TILE	SCT	TOP AND BOTTOM	T&B
STRUCTURAL FACING TILE	SFT	TOP ELEVATION	TE
STRUCTURAL STEEL	STRUCT STL	TOP OF BEAM	TB
SUB-SOIL DRAIN	SSD	TOP OF CONCRETE	TC
SUCTION	SUCT	TOP OF CURB	TC
SUPPLEMENT	SUPPL	TOP OF FINISH FLOOR	TFF
SUPPLY	SPLY	TOP OF FOOTING	TF
SUPPLY AIR	SA	OP OF JOIST	TJ
SUPPLY AIR GRILLE	SAG	TOP OF PAVEMENT	TP
SUPPLY DIFFUSER	SD	TOP OF RIM	TR
SUPPLY FAN	SF	TOP OF SLAB	TSL
SUPPORT	SPRT	TOP OF STEEL	TST
SURFACE	SURF	TOP OF WALL	TW
SURVEY	SURV	TOTAL	TOT
SUSPENDED	SUSP	TOTAL DYNAMIC HEAD	TDH
SUSPENDED CEILING	SUSP CLG	TOTAL PRESSURE	TP
SUSPENDED UNIT HEATER	SUH	TOTALLY ENCLOSED	TE
SWAGE	SWG	TOWEL BAR	TB
SWITCHBOARD	SWBD	TOWEL DISPENSER	TD
SWITCHGEAR	SWGR	TOWEL DISPENSER/RECEPTACLE	TDR
SYMBOL	SYM	TRANSFER	XFR
SYMMETRICAL	SYMM	TRANSFORMER	XFMR
SYNTHETIC	SYNTH	TRANSPARENT	TRANS
SYSTEM	SYS	TREAD	T
TACHOMETER	TACH	TRENCH DRAIN	TD
TACKBOARD	TK BD	TRIGGER START	TS
TANGENT	TAN	TUNNEL	TNL
TECHNICAL	TECH	TURNBUCKLE	TRNBKL
TEE	T	TWISTED PAIR	TP
TELEPHONE	TEL	TWISTED PAIR SHIELDED	TPS
TELEPHONE TERMINAL BOARD	TTB	TYPICAL	TYP
TELEVISION	TV	ULTIMATE	ULT
TEMPERATURE	TEMP	ULTRA HIGH FREQUENCY	UHF
TEMPERATURE CONTROL PANEL	TCP	ULTRAVIOLET	UV
TEMPERATURE CONTROL VALVE	TCV	UNDER FLOOR DUCT	UFD
TEMPERATURE CONTROLLED AIR COMPRESSOR	TCAC	UNDERGROUND	UGND
TEMPERATURE DIFFERENTIAL	TD	UNEXCAVATED	UNEX
TEMPERATURE ENTERING	TE	UNFINISHED	UNFIN
TEMPERATURE LEAVING	TL	UNIFORM	UNIF
TEMPERED	TMPD	UNINTERRUPTIBLE POWER SUPPLY	UPS
TEMPERED GLASS	TMPD GL	UNION	UN
TEMPORARY	TEMP	UNIT HEATER	UH
TEMPORARY BENCH MARK	TBM	UNIT VENTILATOR	UV
TENSILE STRENGTH	TS	UNIVERSAL	UNIV
TERMINAL	TERM	UNLESS OTHERWISE NOTED	UON
TERMINAL UNIT	TU	URINAL	UR
		UTILITY	UTIL

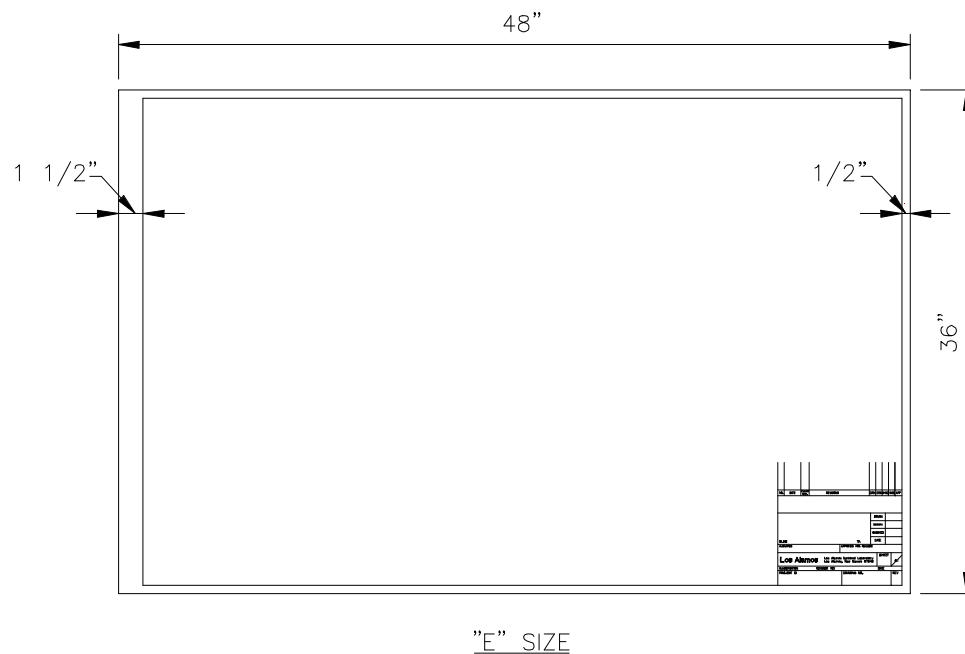
UTILITY SET	US	WELDED	WLD
VACUUM	VAC	WELDED WIRE FABRIC	WWF
VACUUM BREAKER	VB	WEST	W
VACUUM CLEANER OUTLET	VCO	WET BULB	WB
VACUUM PUMP	VP	WET STAND PIPE	WSP
VACUUM RETURN PUMP	VRP	WETTED SURFACE	WS
VALVE	V	WIDE FLANGE	WF
VALVE BOX	VB	WIDTH	WD
VAPOR	VAP	WIND LOAD	WL
VAPOR PROOF	VAP PRF	WINDOW	WDW
VAPOR RETARDER	VR	WIRE GLASS	WGL
VARIABLE AIR VOLUME	VAV	WITH	W/
VARIABLE FREQUENCY DRIVE	VFD	WITHOUT	W/O
VEHICLE	VEH	WOOD	WD
VELOCITY	VEL	WORKING POINT	WP
VENEER	VNR	WORKING PRESSURE	WPR
VENT AIR DAMPER	VADMPR	WROUGHT IRON	WI
VENT AIR DUCT	VAD	YARD BOX	YB
VENT AIR GRILLE	VAGR	YARD CLEANOUT	YCO
VENTILATOR	VENT	YARD DRAIN	YD
VERTICAL	VERT	YARD HYDRANT	YH
VERTICAL UNIT HEATER	VOUH		
VERY HIGH FREQUENCY	VHF		
VERY HIGH OUTPUT	VHO		
VESTIBULE	VEST		
VIBRATION	VIB		
VINYL	VIN		
VINYL BASE	VB		
VINYL COMPOSITION TILE	VCT		
VINYL FACED ACOUSTIC TILE	VFAT		
VINYL TILE	VT		
VINYL WALL COVERING	VWC		
VISCOSITY	VISC		
VITREOUS	VIT		
VITRIFIED CLAY TILE	VCT		
VOLT	V		
VOLT AMPERE	VA		
VOLUME	VOL		
VOLUME DAMPER	VD		
WAFER	WFR		
WAINSCOT	WSCT		
WALL ASH URN	WAU		
WALL CLEANOUT	WCO		
WALL HUNG	WH		
WALL HUNG CONVECTOR	WHC		
WALL HYDRANT	WH		
WALL LOUVER AND SCREEN	WLS		
WALL TO WALL	W/W		
WAREHOUSE	WHSE		
WARM WHITE	WW		
WARM WHITE DELUXE	WWX		
WASH FOUNTAIN	WF		
WASTE	W		
WASTE DISPOSER	WDSP		
WASTE OIL	WO		
WASTE OIL VENT	WOV		
WASTE RECEPTACLE	WR		
WASTEWATER	WW		
WATER	WTR		
WATER CLOSET	WC		
WATER COOLING COIL	WCC		
WATER GAGE	WG		
WATER HAMMER ARRESTER	WHA		
WATER HEATER	WHTR		
WATER LINE	WL		
WATER RESISTANT	WR		
WATER THERMOMETER	WT		
WATERPROOFING	WTRPRF		
WATT	W		
WATTHOUR	WH		
WEATHERSTRIPPING	WS		
WEIGHT	WT		

## 201 DRAWINGS

### 201.1 Drawing Sheet Sizes and Format

- 201.1.1** Produce the standard construction drawing and record drawing on a "D" size sheet.
- 201.1.2** Produce Engineering Studies, Conceptual Design Reports, and Design Criteria drawings on a "B" size sheet.
- 201.1.3** Use "E" size drawing sheets only when the building or map drawing will not fit on a "D" size sheet at a preferred minimum plan scale. Before any drawings are initiated on "E" size sheets, specific approval is required from the LANL Project Leader.
- 201.1.4** Use a consistent size of drawing sheet throughout the drawing set.
- 201.1.5** Provide a continuous line sheet border, as illustrated below, that is .75mm thick.
- 201.1.6** Standard drawing sheet sizes, borders and formats are shown below. The overall dimensions are the sheet cut size.





## 201.2 Final Drawings

**201.2.1** Use paper or black line on a minimum .003 thickness Mylar for final drawings submitted to LANL.

**201.2.2** Do not use stick-ons, appliques, zip-a-tone, etc. on final drawing sheets.

## 201.3 "Not for Construction" Notation

**201.3.1** Note "NOT FOR CONSTRUCTION" on all construction drawing sheets in a construction drawing set. Do not remove this notation until the drawings are approved for final release.

## 201.4 Sealed Drawings

**201.4.1** Comply with the state registration laws for the location of the signature and date when drawings are required to be sealed.

**201.4.2** The preferred location of the seal is to the immediate left of the title block just above the sheet border.



### 202 CONSTRUCTION DRAWING TITLE BLOCKS

Maintain consistency in title block format and content throughout the drawing set for accuracy in the information needed by LANL Facilities Records for the database they maintain of all facilities related design projects, construction projects, modifications and "As-Built" for all LANL facilities.

#### 202.1 Title Block for Construction Drawings

202.1.1 For a description of the required Title Block contents, see 202.2

1	2	3	4	5	6	7	8	9
NO.	DATE	CLASS. REV.	REVISIONS	DWN	DES	CHKD	SUB	APP
10 LOGO HERE								
11				DRAWN		17		
12				DESIGN		18		
13				CHECKED		19		
BLDG. 15		14		TA - 16		DATE		20
SUBMITTED 21				APPROVED FOR RELEASE				22
23 Los Alamos				Los Alamos National Laboratory Los Alamos, New Mexico 87545				SHEET 25 OF 26
CLASSIFICATION 27		REVIEWER 28		DATE		29		
PROJECT ID 30				DRAWING NO. 31				REV. 32

202.1.2 Example of the title block for construction drawings:

NO.	DATE	CLASS. REV.	REVISIONS	DWN	DES	CHKD	SUB	APP
FACILITIES ENGINEERING SERVICES FACILITIES DIVISION								
CRAY Y-MP-90-4 INSTALLATION, LDCC ONE LINE DIAGRAM				DRAWN		D RAFTER		
				DESIGN		D SINER		
				CHECKED		C CHECK		
BLDG. 149B				TA - 3		DATE		1/31/98
SUBMITTED A AUTHOR				APPROVED FOR RELEASE P LEADER				
Los Alamos				Los Alamos National Laboratory Los Alamos, New Mexico 87545				SHEET E1 11 OF 18
CLASSIFICATION U		REVIEWER R VUWER		DATE		1/31/98		
PROJECT ID 10692				DRAWING NO. C45972				REV.

**202.2 Description of the Construction Drawing Title Block Contents**

<b>Item</b>	<b>Description</b>	<b>Character/ Size Font</b>	<b>Data Definition</b>
1	Revision Number	3/32" romans	Number of revisions made to the drawing.
2	Date of Revision	3/32" romans	Date the revision was made to the drawings.
3	Classification		* Signature and name of the person in F Division or Support Services Subcontractor organization authorized to review the classification.
4	Revision Description	3/32" romans	A description of the changes made to the drawing.
5	Drawn	3/32" romans	* Initials and last name or the initials of the designer/drafter.
6	Design	3/32" romans	* Initials and last name or the initials of the designer/engineer.
7	Checked	3/32" romans	* Initials and last name or the initials of the checker.
8	Submitted	3/32" romans	*** Initials of the person in the AE * Firm with the authority to release the drawings.
9	Approved for Release	3/32" romans	*** Initials of the LANL Project * Leader or Facility Manager with final approval for release.
10	Drawing Originating Organization		The logo/name of the organization or firm doing the design.
11	Project Title	3/32" romans	** A descriptive name of the project.
12	Project Title Line 2	3/16" romand	** Space for continuation of the Project Title.
13	Sheet Title	1/8" romand	** A descriptive title of the information contained on the drawing sheet.

14	Sheet Title Line 2	1/8" romand	**	Space for continuation of the Sheet Title.
15	Building Number	1/8" romans		The unique identifying number for a building or structure within a designated technical area.
16	Technical Area	1/8" romans		The geographical area designation assigned to LANL properties.
17	Drawn	3/32" romans	*	First initial and last name of the drafter/designer.
18	Design	3/32" romans	*	First initial and last name of the designer/engineer.
19	Checked	3/32" romans	*	First initial and last name of the person who checked the drawings, but not the same person who designed or produced the drawing.
20	Date	3/32" romans	*	Date the final drawing set is issued. Date all sheets the same.
21	Submitted	3/32" romans	*** *	Typed name and signature of the person at the AE Firm with the authority to release the documents.
22	Approved for Release	3/32" romans	*** *	Typed name and signature of the LANL Project Leader with the final approval for release.
23	Responsible Organization			Logo/name of the organization for whom the drawing is produced (LANL).

24	Discipline Sheet Number	1/4" for up to three characters 3/16" for more than three characters romand	Alpha numeric characters sequentially numbered, by discipline through the project drawing set.
25	Project Sheet Number	3/16" for up to three characters 1/8" for more than three characters romand	A sequential number assigned to each drawing sheet in a project drawing set.
26	Number of sheets in a project drawing set	1/4" for up to three characters 3/16" for more than three characters romand	Total number of drawings in the project drawing set.
27	Classification	3/32" romans	* The security classification of the drawing set. Use "U" designation for unclassified or an "R" for Unclassified Controlled Nuclear Information (UCNI). The LANL Derivative Classifier can provide the classification requirements.
28	Classifier/Reviewer	3/32" romans	* The signature or initial and name of the person authorized to classify drawings.
29	Classification Date	3/32" romans	Date of classification signature - handwritten.
30	Project Identification Number	1/4" romand	A unique number assigned to a task by the F Division.

31	Drawing Number	1/4" romand	A unique number assigned to the drawing set by the F Division. It is an alpha numeric number with not spaces, dashes, or slashes.
32	Revision Number	1/4" romand	Number of revisions made to the drawing.

\*Enter appropriate names and dates electronically. When issuing drawings for design review, initials or signatures are required for the checked, submitted, and classification blocks. For the final issue, initials or signatures are required above or alongside all printed names.

\*\*Do not underline titles or subtitles.

\*\*\*The title block contents (8, 9, 21 & 22) are an example of required approvals. The number and headings of approval signatures/initials shall be determined by the LANL Project Leader.

**202.3 Title Block and Drawing Formats for Engineering Studies, Design Criteria and Conceptual Design Reports**

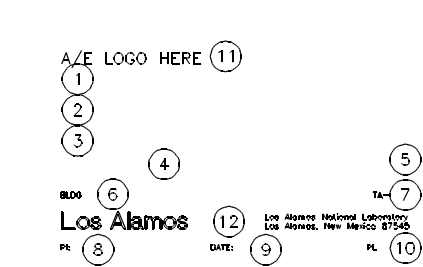
**202.3.1** The drawings produced for Engineering Studies (ES), Design Criteria (DC) and Conceptual Design Reports (CDR) are not intended for use as construction documents, therefore stamps and signatures are not required. The title block information is input into the Facilities Records data base.

**202.3.2** Provide accurate and consistent information in the title block throughout the drawing set.

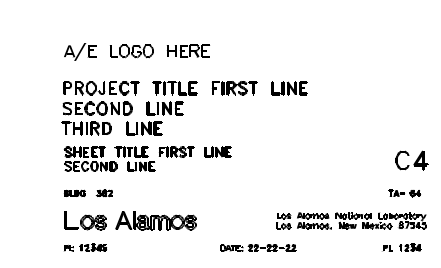
**202.3.3** Produce Engineering Studies, Design Criteria and Conceptual Design Report drawings on 11" X 17" drawing sheets for insertion into the 8-1/2" X 11" report format.

**202.3.4** Specify at the scoping phase if larger drawing sheets are needed.

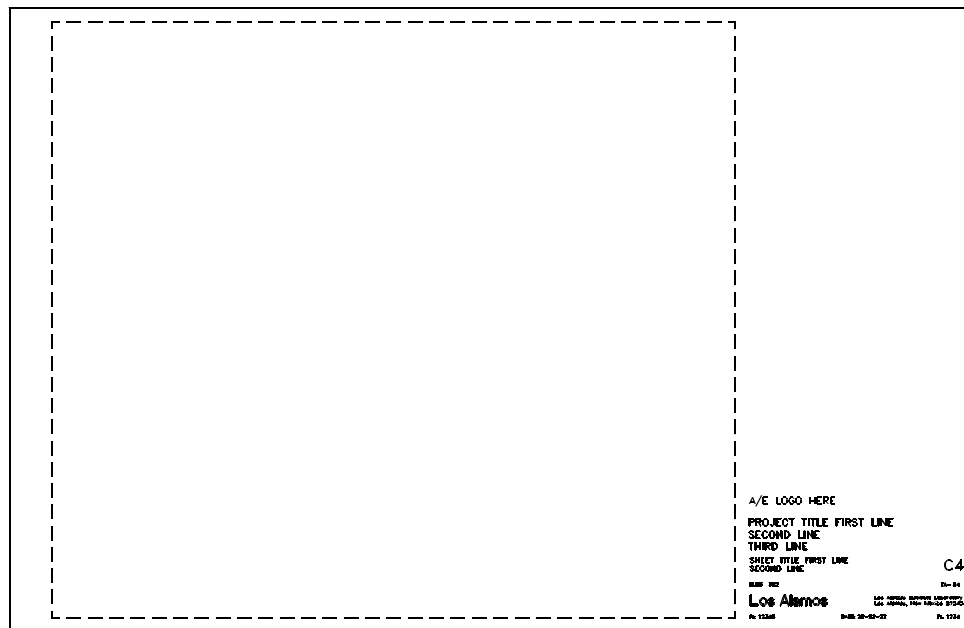
**202.3.5** Convey the project information in the simple format illustrated below. For a description of the required Title Block Contents see 202.4



**202.3.6** The following is an example of the format for studies and reports



- 202.3.7** The preferred extent of the drawing field and an example of the title block are shown below. This allows for the consistent placement notes and legends. The preferred extent of the drawing field is illustrated with the dashed line. There is no border.



**202.4 Description of the Engineering Study, Design Criteria and  
Conceptual Design Report Title Block Contents**

<b>Item</b>	<b>Description</b>	<b>Character/ Size Font</b>	<b>Data Definition</b>
1	Project Title	1/8" romand	* A descriptive name of the project.
2	Project Title Line 2	1/8" romand	* Space for continuation of the Project Title
3	Project Title Line 3	1/8" romand	* Space for continuation of the Project Title
4	Sheet Title	3/32" romand	* A descriptive title of the information contained on the drawing sheet. There are two lines formatted for continuation of the sheet title if needed.
5	Discipline Sheet Number	3/16" romand	Alpha numeric character, sequentially numbered, by discipline through the project drawing set.
6	Building Number	1/16" romans	The unique identifying number for a building or structure within a designated technical area.
7	Technical Area	1/16" romans	The geographical area designation assigned to LANL properties.
8	Project Identification Number	1/16" romans	A unique number assigned to a task by the F Division.
9	Date	1/16" romans	The date the drawing set is issued for review or as final. Use the same date for all sheets in the drawing set.
10	Engineering Plate Number	1/16" romans	A unique number assigned by F Division.



- |    |                                  |  |
|----|----------------------------------|--|
| 11 | Drawing Originating Organization | The logo/name of the organization or firm doing the design.            |
| 12 | Responsibility Organization      | Logo/name of the organization for whom the drawing is produced (LANL). |

\*Do not underline titles or subtitles.

## 203 TITLE SHEET

## 203.1 General Requirements

- 203.1.1** Provide a title sheet ("T" Sheet) for the Support Services Subcontractor construction projects when the drawing set contains 10 or more drawing sheets. A location plan is not required.
- 203.1.2** Provide a title sheet for construction drawings produced by a subcontracted A/E, regardless of the number of drawing sheets in the drawing set.

### 203.2 Example of Title Sheet

The following is an example of the Title Sheet.

# PROJECT TITLE

## BLDG 222 TA-44

2

N

LOCATION PLAN

SCALE: NONE

**PROJECT DESIGN DATA**

ANY CODE ANALYSIS AND THAT WAS  
IMPORTANT IN THE DESIGN PROCESS  
SHALL BE DOCUMENTED HERE.  
CHARACTERS OF IMPORTANT INFO ARE  
OCCUPANCY CLASSIFICATION  
TYPE OF CONSTRUCTION  
BUILDING AREA  
AREA OF ROOF LOADS

**LIST OF DRAWINGS**

SHEET NUMBER	DISCIPLINE SHEET NUMBER	DRAWING TITLE
1	T1	TITLE SHEET
2	G1	GEN. SUBMITTAL SHEET
3	C1	CIVIL GRADING PLANS
4	CE	CIVIL UTIL. PLANS
5	CL	CIVIL LANDSCAPING PLANS
6	CU	CIVIL UTILITY PLANT PLANS
7	DS	CIVIL ROAD PLANS
8	DS	CIVIL ROAD PROFILES
9	A1	ARCH. EXTERIOR ELEVATIONS
10	A2	ARCH. PLANS, LEGEND
11	A3	ARCH. ELEVATIONS AND SECTIONS
12	A4	ARCH. DETAILS AND SCHEDULES
13	S1	STRUCT. EXTERIOR ELEVATIONS
14	S2	STRUCT. FOUNDATIONS, PLANS, NOTES, SCHEDULES, LEGENDS, STEEL DETAILS, AND NOTES
15	S3	STRUCT. FRAMING PLANS, DETAILS, SECTIONS, AND SCHEDULES
16	M1	MECH. LEGEND
17	M2	MECH. EXTERIOR ELEVATIONS
18	M4	MECH. HVAC PLANS, SECTIONS, DETAILS AND CONTROL DIAGRAMS
19	M5	MECH. PLUMBING PLANS, SECTIONS, AND DETAILS
20	M6	MECH. FIRE PROTECTION PLANS, SECTIONS, AND DETAILS
21	M7	MECH. SCHEDULES
22	E1	ELECT. SCOPE OF WORK, NOTES AND LEGENDS
23	E2	ELECT. EXTERIOR ELECTRICAL SITE PLAN
24	E3	ELECT. ONE-LINE DIAGRAM
25	E4	ELECT. EXTERIOR ELEVATIONS
26	E5	ELECT. POWER PLAN
27	E6	ELECT. GROUNDING ONE-LINE DIAGRAM
28	E7	ELECT. LIGHTING PLAN
29	E8	ELECT. SPECIAL SYSTEMS PLAN
30	E9	ELECT. LIGHTNING PROTECTION AND GROUNDING
31	E10	ELECT. ELEVATIONS, SECTIONS AND DETAILS
32	E11	ELECT. SCHEMATICS
33	E12	ELECT. SPECIAL SYSTEMS
34	E13	ELECT. PANEL SCHEDULES
35	E14	ELECT. NAMEPLATE SCHEDULE
36	E15	ELECT. EQUIPMENT SCHEDULE

**PROJECT DESIGN DATA**

ANY CODE ANALYSIS AND THAT WAS  
IMPORTANT IN THE DESIGN PROCESS  
SHALL BE DOCUMENTED HERE.  
CHARACTERS OF IMPORTANT INFO ARE  
OCCUPANCY CLASSIFICATION  
TYPE OF CONSTRUCTION  
BUILDING AREA  
AREA OF ROOF LOADS

**LIST OF DRAWINGS**

SHEET NUMBER	DISCIPLINE SHEET NUMBER	DRAWING TITLE
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2	G1	GEN. SUBMITTAL SHEET
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4	CE	CIVIL UTIL. PLANS
5	CL	CIVIL LANDSCAPING PLANS
6	CU	CIVIL UTILITY PLANT PLANS
7	DS	CIVIL ROAD PLANS
8	DS	CIVIL ROAD PROFILES
9	A1	ARCH. EXTERIOR ELEVATIONS
10	A2	ARCH. PLANS, LEGEND
11	A3	ARCH. ELEVATIONS AND SECTIONS
12	A4	ARCH. DETAILS AND SCHEDULES
13	S1	STRUCT. EXTERIOR ELEVATIONS
14	S2	STRUCT. FOUNDATIONS, PLANS, NOTES, SCHEDULES, LEGENDS, STEEL DETAILS, AND NOTES
15	S3	STRUCT. FRAMING PLANS, DETAILS, SECTIONS, AND SCHEDULES
16	M1	MECH. LEGEND
17	M2	MECH. EXTERIOR ELEVATIONS
18	M4	MECH. HVAC PLANS, SECTIONS, DETAILS AND CONTROL DIAGRAMS
19	M5	MECH. PLUMBING PLANS, SECTIONS, AND DETAILS
20	M6	MECH. FIRE PROTECTION PLANS, SECTIONS, AND DETAILS
21	M7	MECH. SCHEDULES
22	E1	ELECT. SCOPE OF WORK, NOTES AND LEGENDS
23	E2	ELECT. EXTERIOR ELECTRICAL SITE PLAN
24	E3	ELECT. ONE-LINE DIAGRAM
25	E4	ELECT. EXTERIOR ELEVATIONS
26	E5	ELECT. POWER PLAN
27	E6	ELECT. GROUNDING ONE-LINE DIAGRAM
28	E7	ELECT. LIGHTING PLAN
29	E8	ELECT. SPECIAL SYSTEMS PLAN
30	E9	ELECT. LIGHTNING PROTECTION AND GROUNDING
31	E10	ELECT. ELEVATIONS, SECTIONS AND DETAILS
32	E11	ELECT. SCHEMATICS
33	E12	ELECT. SPECIAL SYSTEMS
34	E13	ELECT. PANEL SCHEDULES
35	E14	ELECT. NAMEPLATE SCHEDULE
36	E15	ELECT. EQUIPMENT SCHEDULE

**PROJECT DESIGN DATA**

ANY CODE ANALYSIS AND THAT WAS  
IMPORTANT IN THE DESIGN PROCESS  
SHALL BE DOCUMENTED HERE.  
CHARACTERS OF IMPORTANT INFO ARE  
OCCUPANCY CLASSIFICATION  
TYPE OF CONSTRUCTION  
BUILDING AREA  
AREA OF ROOF LOADS

**LIST OF DRAWINGS**

SHEET NUMBER	DISCIPLINE SHEET NUMBER	DRAWING TITLE
1	T1	TITLE SHEET
2	G1	GEN. SUBMITTAL SHEET
3	C1	CIVIL GRADING PLANS
4	CE	CIVIL UTIL. PLANS
5	CL	CIVIL LANDSCAPING PLANS
6	CU	CIVIL UTILITY PLANT PLANS
7	DS	CIVIL ROAD PLANS
8	DS	CIVIL ROAD PROFILES
9	A1	ARCH. EXTERIOR ELEVATIONS
10	A2	ARCH. PLANS, LEGEND
11	A3	ARCH. ELEVATIONS AND SECTIONS
12	A4	ARCH. DETAILS AND SCHEDULES
13	S1	STRUCT. EXTERIOR ELEVATIONS
14	S2	STRUCT. FOUNDATIONS, PLANS, NOTES, SCHEDULES, LEGENDS, STEEL DETAILS, AND NOTES
15	S3	STRUCT. FRAMING PLANS, DETAILS, SECTIONS, AND SCHEDULES
16	M1	MECH. LEGEND
17	M2	MECH. EXTERIOR ELEVATIONS
18	M4	MECH. HVAC PLANS, SECTIONS, DETAILS AND CONTROL DIAGRAMS
19	M5	MECH. PLUMBING PLANS, SECTIONS, AND DETAILS
20	M6	MECH. FIRE PROTECTION PLANS, SECTIONS, AND DETAILS
21	M7	MECH. SCHEDULES
22	E1	ELECT. SCOPE OF WORK, NOTES AND LEGENDS
23	E2	ELECT. EXTERIOR ELECTRICAL SITE PLAN
24	E3	ELECT. ONE-LINE DIAGRAM
25	E4	ELECT. EXTERIOR ELEVATIONS
26	E5	ELECT. POWER PLAN
27	E6	ELECT. GROUNDING ONE-LINE DIAGRAM
28	E7	ELECT. LIGHTING PLAN</

- 203.2.1** Provide a title sheet that complies with the format shown in 203.2. See 203.3 for a description of the title sheet contents.

PROJECT TITLE ①

③ BLDG 222 TA-44 ④

LIST OF DRAWINGS ⑥

⑧ SHEET NUMBER	DISCIPLINE SHEET NUMBER ⑨	DRAWING TITLE ⑩
1	T1	TITLE SHEET
2	G1	SUBMITTAL SHEET
3	C1	SITE UTILITY PLAN
⑪ 4	A1 ⑫	FLOOR PLAN ⑬
5	S1	FOUNDATION PLAN
6	M1	HVAC PLAN
7	P1	PIPING PLAN
8	E1	POWER PLAN

**203.3 Description of the Title Sheet Contents**

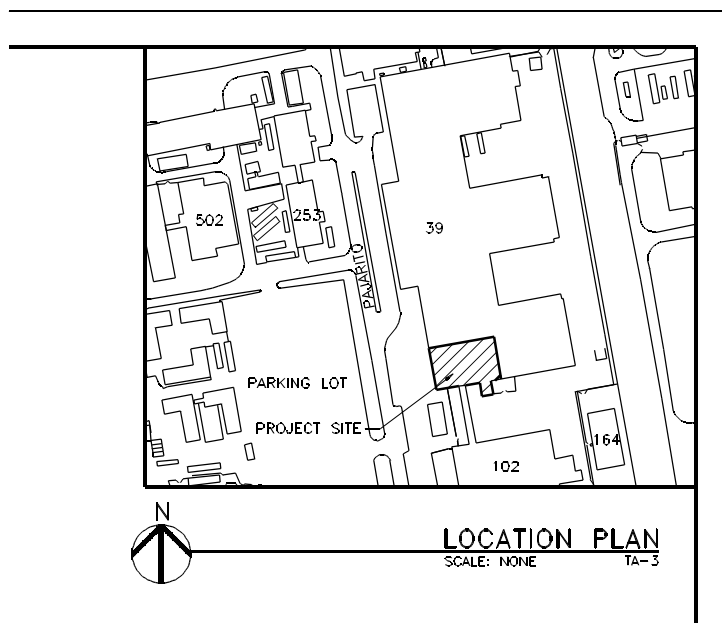
<b>Item</b>	<b>Description</b>	<b>Character/ Size Font</b>	<b>Data Definition</b>
1	Project Title	1" standard AutoCAD font-double underline	The descriptive name of the project. Use a standard AutoCAD font.
2	Location Plan	no scale	A plan which illustrates the location of the project - see 203.4.
3	Building Number	1/2" standard AutoCAD font-double underline	The unique identifying number for a building or structure within a designated technical area.
4	Technical Area	1/2" standard AutoCAD font-double underline	The geographical area designation assigned to LANL properties.
5	Project Design Data	3/32" min romans	This information is optional - usually pertinent code analysis information is inserted here.
6	List of Drawings	1/4" romand- single underline	The header for the Drawing List.
7	Product Options and Substitution Statement	3/32" min romans	A brief LANL procurement policy statement - see 203.5.
8	Sheet Number	1/8" romand	The column header for the list of drawings sheet numbers.
9	Discipline Sheet Number	1/8" romand	The column header for the list of drawings discipline sheet numbers
10	Drawing Title/Header	1/8" romand	List of the drawing sheet titles - show exactly as they appear in the title blocks of the drawing sheets.

11	Sheet Number	3/32" min romans	The number shown in the title block of each drawing sheet.
12	Discipline Sheet Number	3/32" min romans	The number shown in the title block of each discipline drawing sheet.
13	Drawing Titles	3/32" min romans	List of drawing sheet titles - show exactly as they appear in the title blocks of the drawing sheets.
14	Title Block	-	See Section 202.

### 203.4 Location Plan

An area map which graphically illustrates the general location, by technical area, where the construction is planned.

- 203.4.1** All drawing packages except projects to be constructed by the Support Services Subcontractor are required to have a Location Plan.
- 203.4.2** Locate this plan on the Title Sheet in the upper right hand corner of the sheet, as illustrated in 203.2.
- 203.4.3** Show enough of the surrounding areas (streets, buildings, structures, etc.) to clearly identify the project location.
- 203.4.4** Orient the location plan on the drawing sheet so that the north arrow points to the top of the sheet, as illustrated.
- 203.4.5** An electronic or hard copy location plan can be obtained from F Division Facilities Records or the Support Services Subcontractor "As-Built" program.



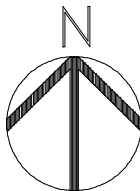
### 203.5 Product Options and Substitutions

Enter the substitutions statement exactly as stated in Section 01630 of the LANL Facility Construction Specifications.



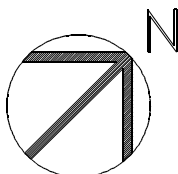
## **205 NORTH ARROW SYMBOL**

### **205.1 Example of North Arrow**



### **205.2 General Requirements for North Arrow**

- 205.2.1** The preferred placement of the North Arrow is to the left of the plan title.
- 205.2.2** Create the infill hatch so that it is dense enough to allow the arrow to read clearly, but not so dense a hatch that the infill reads as a solid on a half size or 11" x 17" sheets.
- 205.2.3** For "C," "D" and "E" size sheets make the circle 5/8". For "A" and "B" size sheets make the circle 5/16".
- 205.2.4** Make The "N" 3/16" romand on "C," "D" and "E" size sheets. For "A" and "B" size sheets make the "N" 3/32" romand.
- 205.2.5** Always locate the "N" at the arrow point, but maintain the same orientation for the "N" regardless of the degree that the arrow is rotated to indicate true North. The following illustrates the format for rotated North arrows.

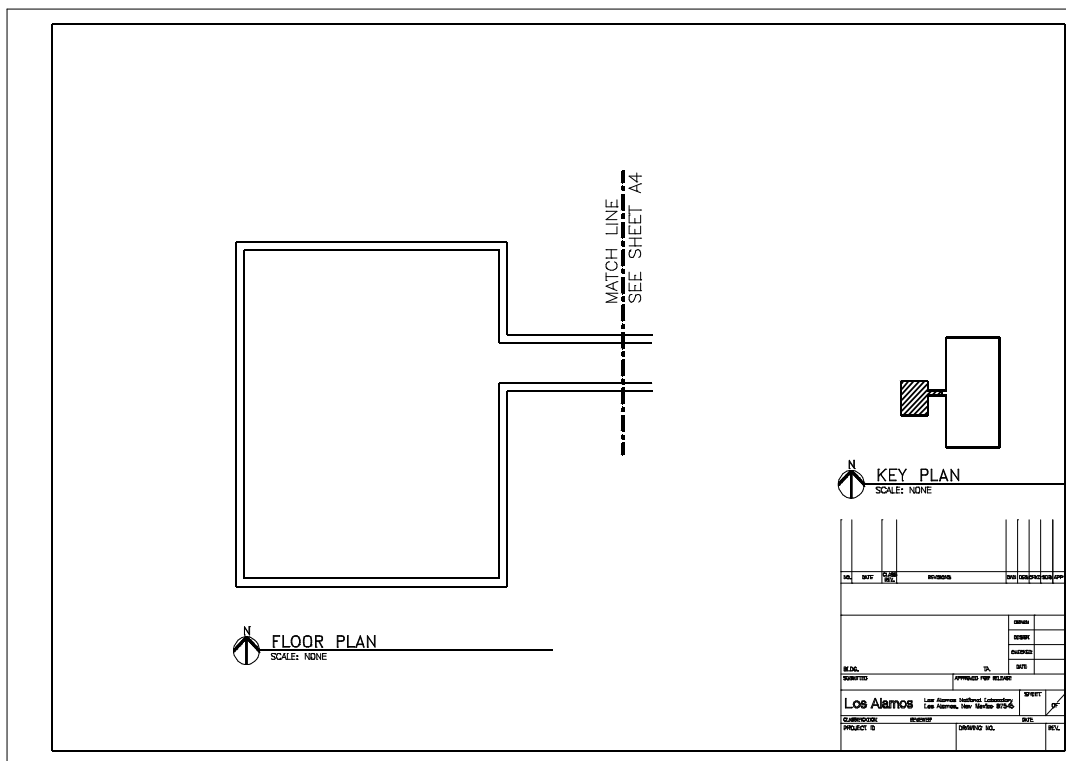




## 206 PARTIAL PLANS

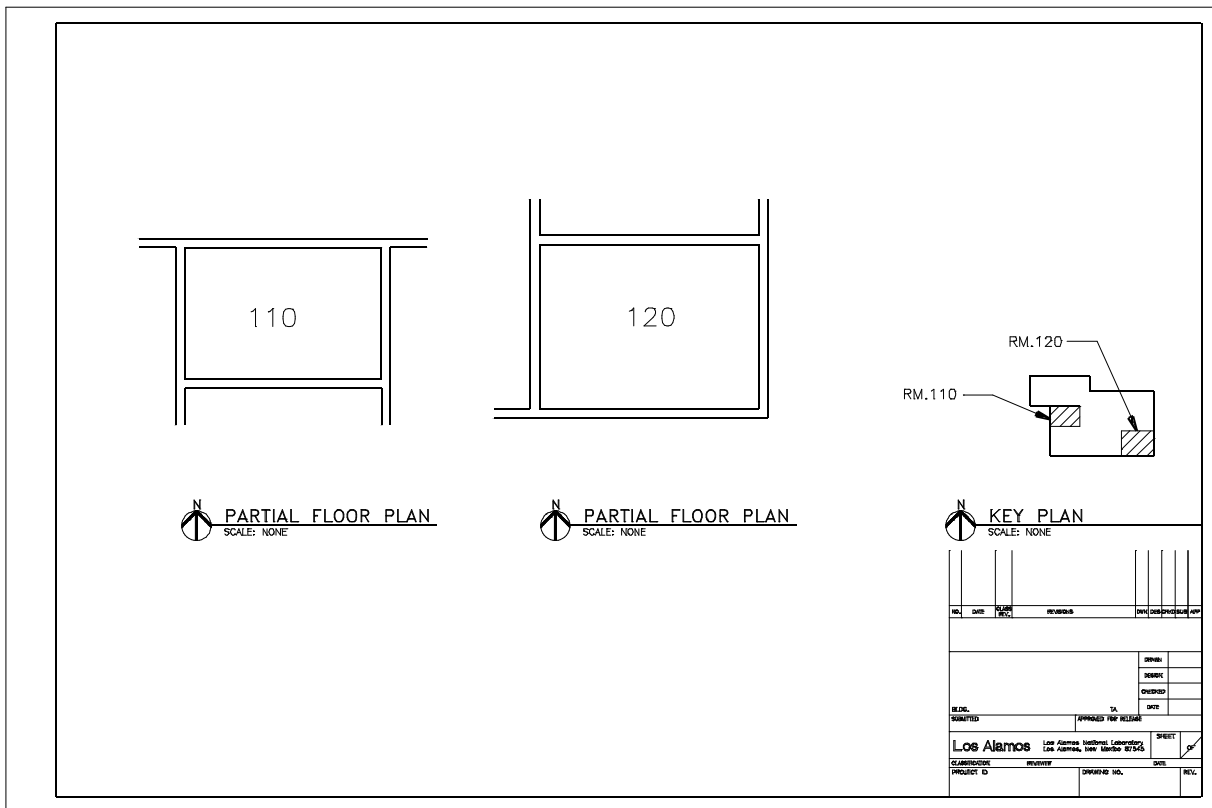
## 206.1 Match Lines

- 206.1.1** When a plan is too large for one drawing sheet, divide the plan into logical sections.
- 206.1.2** Provide a match line that is .75mm thick
- 206.1.3** Label the "match line" to clearly indicate where the plan continues on another sheet, as illustrated below.
- 206.1.4** Use a key plan (see Section 206.2).



## 206.2 Key Plans

- 206.2.1** Use a small scale "key plan" for each drawing sheet on which a partial plan appears.
- 206.2.2** Clearly indicate on the "key plan" where the partial plan occurs in the overall building layout.
- 206.2.3** Orient partial plans and key plans identically.



**207 Submittal Sheet****207.1 Criteria and Guidelines for Submittal Sheet**

**207.1.1** Include a submittal sheet ("G" Sheet) in the drawing set when submittals are required, but a specification package is not included with the construction documents. Use the following guidelines in producing the submittal sheet and stating the submittal requirements:

**207.1.2** Produce a Submittal Schedule and Definition of Submittal Types on the "G" sheet (See Section 207.3).

**207.1.3** Do not place submittal lists on any of the discipline sheets.

**207.2 Guidelines for Numbering the Required Submittals**

**207.2.1** Assign each submittal an alpha numeric designation using no more than 3 characters. This alpha numeric designation is the "SUB NO." in the submittal schedule illustrated on the following page.

**207.2.2** The first character in the alpha numeric designation represents the discipline requiring the submittal. Assign an alpha character representing the discipline using the following guidelines:

C - Civil  
S - Structural  
A - Architectural  
M - Mechanical  
P - Plumbing (when P sheets are used)  
E - Electrical

**207.2.3** Next, assign a number designation to the submittal, sequentially numbering each submittal by discipline.

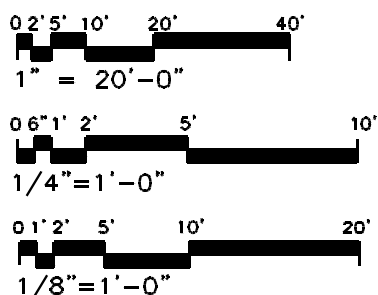
### 207.3 Example of Submittal Sheet Content

[illegible]

## 208 DRAWINGS SCALES

### 208.1 Graphic Scales

When drawings are produced at a scale(s), display graphic scales illustrating the drawing scale(s) used. This applies to Construction Drawings, Engineering Studies, Conceptual Design Reports (CDR) and Design Criteria drawings. Use the following format for standard graphic scales:



In the illustration above, 3/32" text (the minimum allowable) is shown for the distance designations because of the limited space available. The drawing scale designation text is shown at 1/8". These text heights were selected for graphic clarity, text heights are optional.

### 208.2 Preferred Drawing Scales

The preferred drawing scales and the call out protocol for drawings are as follows:

Site Plans:	1" = 10'	Profiles:	1" = 20'
	1" = 20'	Horizontal Scale:	1" = 10'
	1" = 50'	Vertical Scale:	1" = 5'
Utility Plans:	1" = 10'	Sections:	1/4" = 1'-0"
	1" = 20'		1/2" = 1'-0"
	1" = 50'		3/4" = 1'-0"
	1" = 100'		1" = 1'-0"
Floor Plans and Elevations:	1/8" = 1'-0"	Detail/Partial Plans:	1/4" = 1'-0"
	1/4" = 1'-0"		1/2" = 1'-0"
Details:	1/2" = 1'-0"		
	3/4" = 1'-0"		
	1" = 1'-0"		
	1-1/2" = 1'-0"		
	3" = 1'-0"		

### 208.3 Consistency of Drawing Scales

Draw all principal plans in a drawing set at the same scale.

### 208.4 Confined Space Drawing Scales

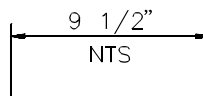
**208.4.1** Lay out all equipment, piping, conduits, trays, ducts, wiring, etc., located within the mechanical equipment room or other confined areas on an enlarged partial floor plan shown at  $1/4" = 1'-0"$  scale minimum.

**208.4.2** In confined spaces that ARE designed to accommodate equipment, show the equipment layout in detail plans, interior elevations and sections, as required for clarity.

**208.4.3** Use enlarged sections and details to show congested areas at minimum scale of  $1/2" = 1'-0"$ , for clarity.

### 208.5 Dimensions Not to Scale

When dimensional changes are made on drawings that effect the dimensions shown on a detail, it is not necessary to change the detail to agree with the new dimension. Change the dimension text to match the new dimension and note "NTS" below the dimension line, to indicate "not to scale," as illustrated below.



### 208.6 No Scale Drawings

Certain details, diagrams, and plans cannot or need not be drawn to a specific scale (ie: wiring and schematic diagrams, and control diagrams). For the drawing scale notation type "SCALE: NONE" indicating that no scale was used in generating the drawing.

**DETAIL**

SCALE: NONE



**209 DIMENSIONING****209.1 General**

- 209.1.1** Specify dimensions of less than one foot in inches, for example:

11 1/2"

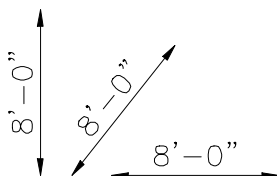
- 209.1.2** Specify dimensions one foot and over in feet and inches, for example:

2'-6 1/4"

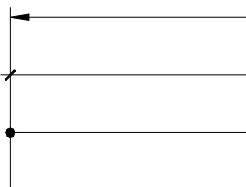
- 209.1.3** Exception to these rules occur when dimension mechanical ductwork and piping, electrical control cabinets and boxes, or architectural woodwork.

**209.2 Dimension Line Convention and Text Orientation**

- 209.2.1** Use unbroken dimension lines with the dimension text located above the line. All dimension text must be read from the bottom or right side of the drawing sheet.

**209.3 Dimension Line Termination**

- 209.3.1** Arrowheads, slashes and dots are all acceptable terminators for dimension lines.
- 209.3.2** Draw a heavy terminator to insure readability when reproduced or reduced to half size. Use a consistent terminator throughout all drawing sheets for a discipline in a drawing set.



**209.4 Plan Dimensions**

- 209.4.1** Keep dimension lines clear of the building footprint whenever possible.
- 209.4.2** Place dimension lines in a logical progression (i.e., centerlines, projections, overall, etc.).
- 209.4.3** Keep the dimensions consistent on all plans.
- 209.4.4** Tie all building portions together clearly.



## **210 ORDER OF DISCIPLINES**

### **210.1 Organization of Drawing Sets**

**210.1.1** Organize the drawing sets by discipline in the following order:

1. Civil
2. Structural
3. Architectural
4. Mechanical
5. Plumbing (when "P" sheets are used)
6. Electrical

**211 ORDER OF DRAWINGS WITHIN A DRAWING SET AND WITHIN A DISCIPLINE****211.1 Preferred Order of Drawings**

General:	Title Sheet ("T" Sheet) Submittal Sheet ("G" Sheet) (For construction by the Support Services Subcontractor only)
Civil:	Demolition Site Plan, Notes, Legend, and Soil Boring Logs Sections and Profiles Details
Structural:	Demolition Foundation Plans, Notes, Schedules, Legend, Steel Details, and Notes Framing Plans, Details, Sections, and Schedules
Architectural:	Demolition Plans, Legends Elevations and Sections Details and Schedules
Mechanical:	Legend Notes/Specifications (Jobs w/o Specification Volume Only) Demolition HVAC Plans, Sections, Details, and Control Diagrams Schedules, Equipment Lists, Equipment Schedules, etc.
Plumbing:	Plumbing Plans, Elevations, Sections, Details and Schedules Fire Protection Plans, Elevations, Sections Details and Schedules
Electrical:	Legends, Scope of Work (for Construction by Support Services Subcontractor only), General Electrical Notes (Jobs w/o Specification volume only) Exterior Electrical Site Plan One-line Diagram Demolition Plan(s) Grounding One-line Diagram Power Plan(s) Lighting Plan(s)

Electrical:	Special Systems Plan(s)
(cont.)	Lightning Protection and Grounding Plan(s)
	Elevations, Sections, and Details
	Schematics
	Special Systems
	Panel Systems
	Nameplate Schedule
	Equipment Schedule

## 212 LINE WORK

### 212.1 Basic Line Widths

- 212.1.1** Use a heavy line width to indicate new construction for a given discipline.
- 212.1.2** Use a medium line width for text and to delineate new construction above or below the drawing plane.
- 212.1.3** Use a light line width to delineate existing construction or new background base plans, and for dimension lines, leader lines and extension lines.
- 212.1.4** Contrast the three line widths definitively as illustrated below:

LINE DESCRIPTION	LINE APPEARANCE	LINE TYPE	LINE WIDTH	
CENTER LINE		CENTER	0.25 MM	0.010 INCH
DIMENSION LINE		CONTINUOUS	0.25 MM	0.010 INCH
LEADER LINE		CONTINUOUS	0.25 MM	0.010 INCH
FUTURE CONSTRUCTION		DASHED	0.25 MM	0.010 INCH
EXISTING CONSTRUCTION		PHANTOM	0.25 MM	0.010 INCH
NEW CONSTRUCTION AND REVISION CLOUD		CONTINUOUS	0.50 MM	0.020 INCH
BACKGROUND, NEW CONST.		CONTINUOUS	0.25 MM	0.010 INCH
HIDDEN LINE		HIDDEN	0.35 MM	0.015 INCH
MATCH LINE		CENTER	0.70 MM	0.030 INCH
EXISTING TO BE REMOVED		PHANTOM	0.25 MM (0.010 INCH) LINE 0.50 MM (0.020 INCH) ASTERISK	

**213 STANDARDIZATION OF TEXT****213.1 Font Styles and Text Size Requirements**







- 213.1.1** Use only standard AutoCAD fonts, preferably romans and romand. Do not use stylized fonts or fonts not standard to AutoCAD.
- 213.1.2** Fonts other than romans and romand can be used on the Title Sheet (Section 203) and for the Title Block logos. If a logo contains a font that is not standard to AutoCAD, convert the logo to a drawing or change the logo to an electronic format that can be read by the standard AutoCAD package.
- 213.1.3** Match the existing font style and height for uniformity of presentation, when revising existing drawings.
- 213.1.4** The minimum text height in the drawing field on C, D, and E size sheets is 3/32 inch.
- 213.1.5** The minimum text height in the drawing field on A and B size sheets is 1/16 inch.
- 213.1.6** The minimum text height only applies in circumstances when another convention is not specified in this document.

**213.2 Text Formatting Conventions**

- 213.2.1** Create all text in upper case letters, with the exception of certain unit designations such as kVA, mm, kHz, Vac, Vdc, mA, which are recognized as an industry standard.
- 213.2.2** Use text that is readable when reduced to one-half size on half-size drawing sets.
- 213.2.3** Leave a minimum space of 1/2 the text height between text lines and special marks to maintain legibility.
- 213.3.4** Maintain standard text conventions across disciplines in a drawing set.
- 213.3.5** Orient text to read horizontally from left to right and/or vertically from the bottom to the top of the sheet.
- 213.3.6** The "Sub Title" designation referred to in the table below is most commonly used in schedules. The schedule title is the

main title (1/4" romand) and the column headers for the schedule are the sub titles (3/16" romand).

**213.3.7** When inserting text into a D or E size drawing, comply with the following:

TEXT FOR	EXAMPLE	LINE WIDTH	FONT
MAIN TITLE	ABCDEFG    RSTU  1/4" WXYZ  1/4"	0.50 MM 0.020 INCH	ROMAND
SUB TITLE	ABCDEFG    VWXYZ  3/16" VWXYZ  3/16"	0.35 MM 0.015 INCH	ROMAND
ALL TITLE BLOCK TEXT	(SEE SECTION 202 FOR CHARACTER SIZE)	0.35 MM 0.015 INCH	SEE SECT 202 FOR FONT
ALL OTHER TEXT	MINIMUM SIZE TEXT ABCDEFG    VWXYZ  3/32" ABCDEFG    VWXYZ  3/32"	0.35 MM 0.015 INCH	ROMANS

**214 SECTIONS, ELEVATIONS, DETAILS, AND CALLOUTS**

Identify sections, elevations and details by referencing them with symbols or callouts.

**214.1 Reference Designations**

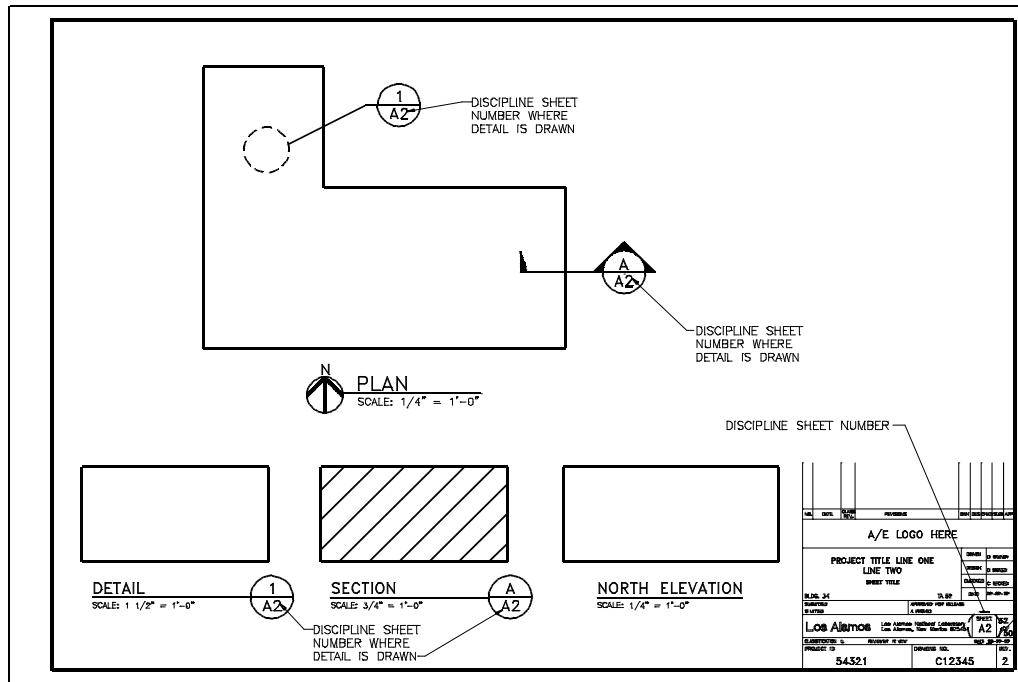
- 214.1.1** Identify sections and elevations by LETTERS, and details by NUMBERS. Reference sections, elevations and details with the discipline sheet number, for example: A1, C1, S1.....

**214.2 Protocol for References and Callouts**

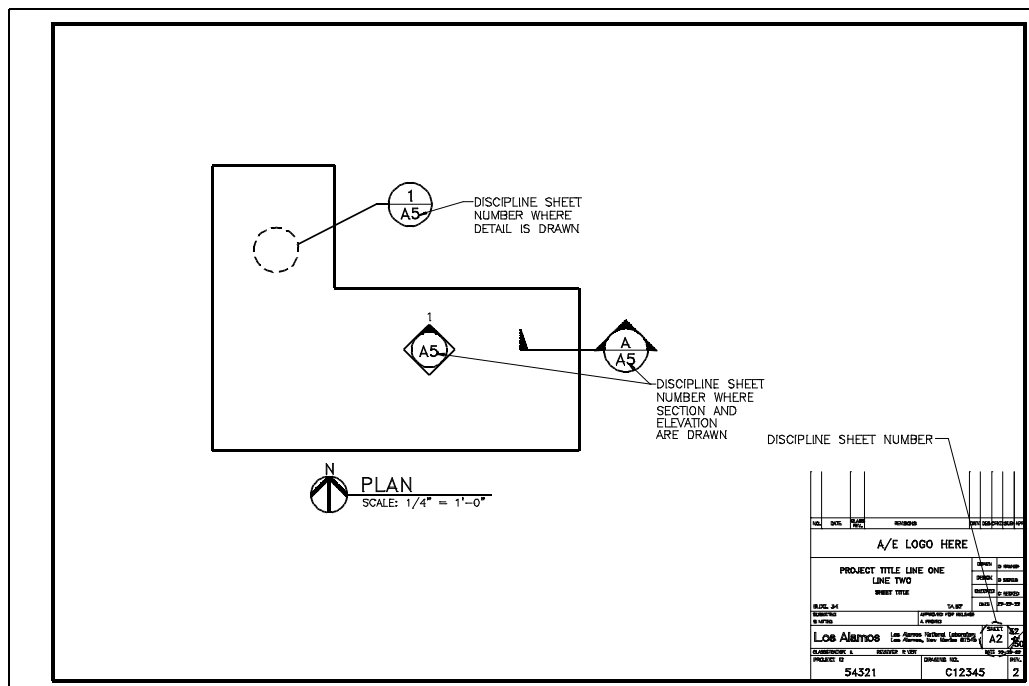
- 214.2.1** On the sheet where details, sections or elevations are drawn, number or letter them independently by sheet, as opposed to consecutively by discipline or project. Order the numbers and letters sequentially in each drawing sheet that contains elevations, details or sections. Begin with the number 1 or the letter A for the elevation, detail or section designation.
- 214.2.2** When a detail or section is eliminated, the deleted detail or section number or letter may be reused or left blank. The details or sections do not have to be renumbered as the result of a deletion.

### 214.3 Examples of Protocols

**214.3.1** A section or elevation drawn on the sheet where it is referenced:

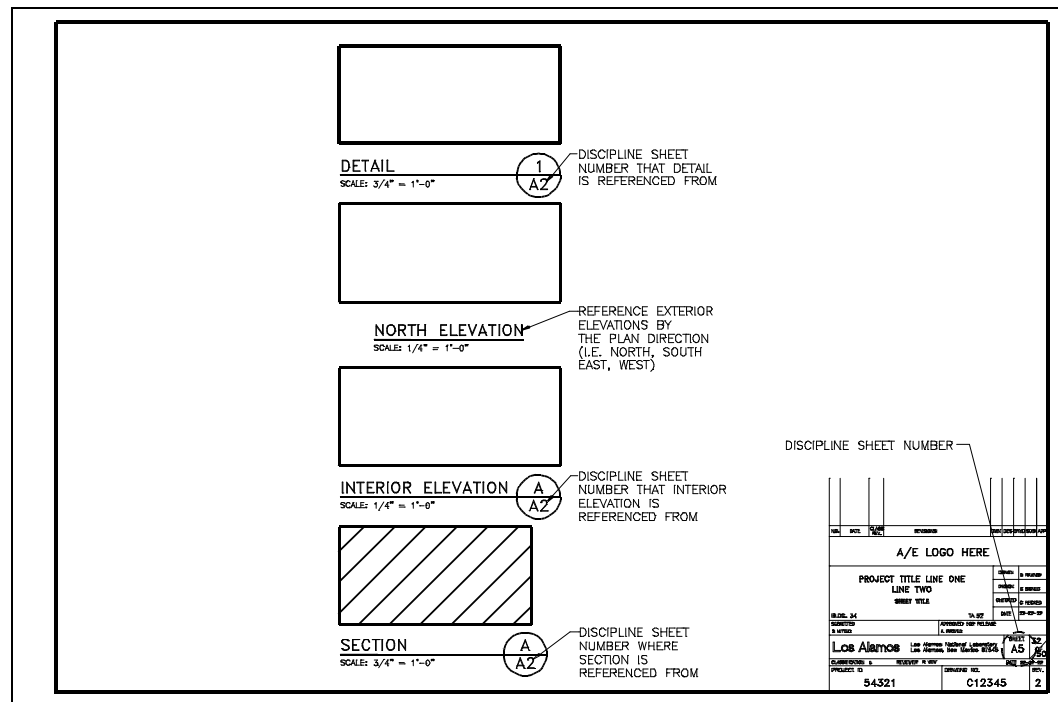


**214.3.2** A detail, section or elevation not drawn on the sheet it is referenced or cut:



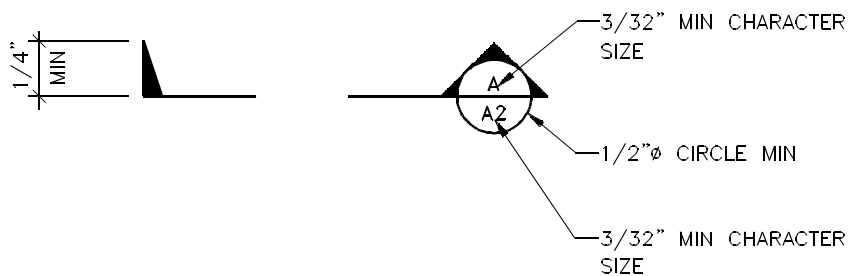


**214.3.2** (cont):

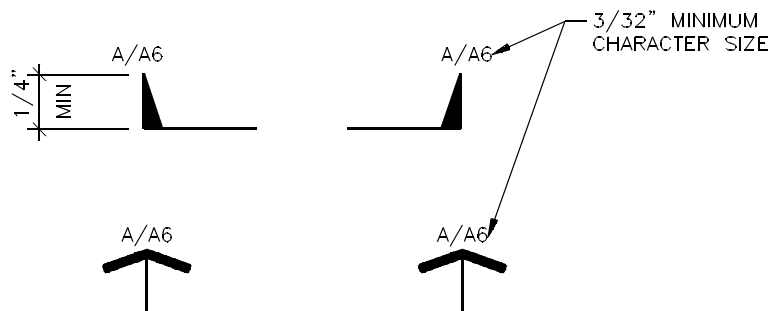


## 214.4 Section Symbols

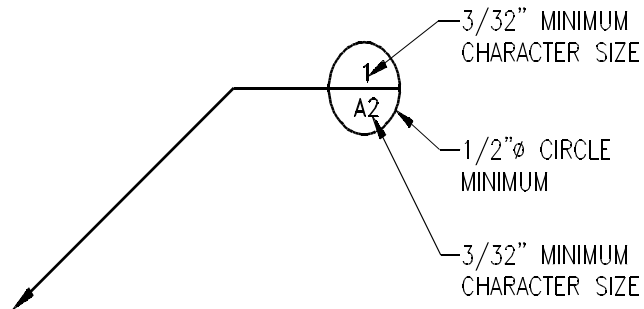
### 214.4.1 Standard Section Symbol:



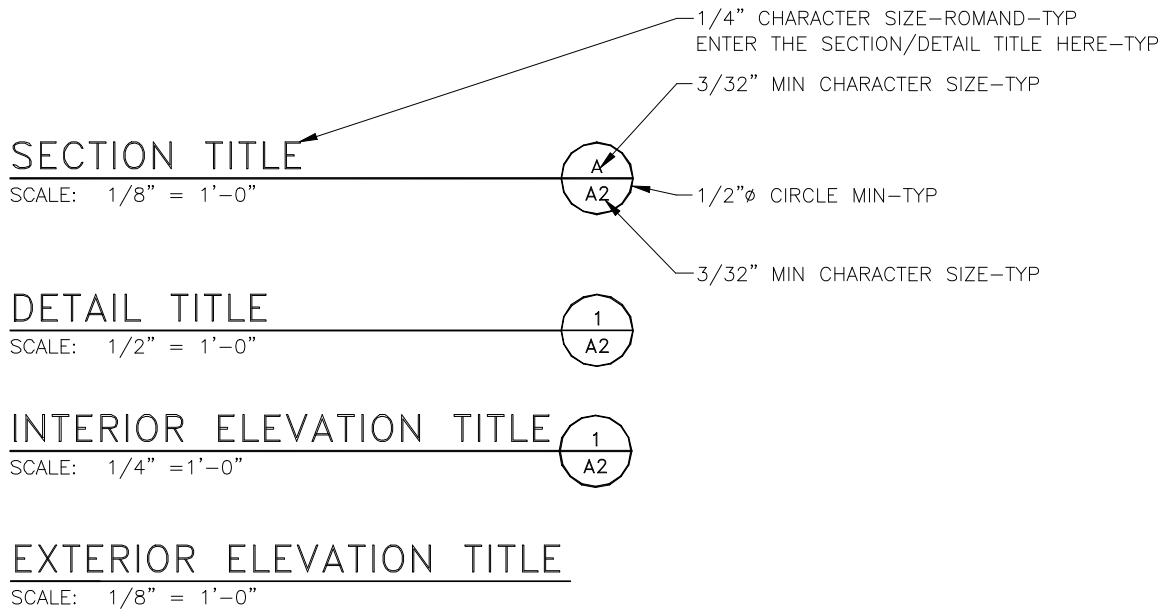
**214.4.2** Acceptable Section Symbols when space for referencing is severely restricted:



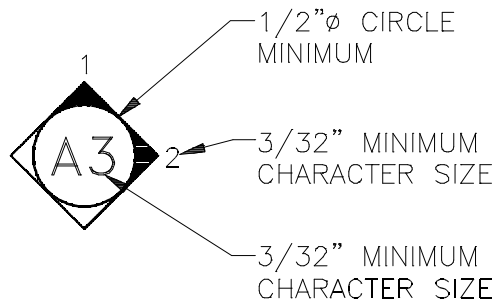
### 214.5 Detail Symbol



### 214.6 Section, Elevation and Detail Titles



### 214.7 Interior Elevations Symbol



### 214.8 Exterior Elevations

Reference exterior elevations by the plan direction (i.e. North, South, East, West)

### 214.9 Keyed Notes

- 214.9.1** Use keyed notes where space is limited in the drawing field.
- 214.9.2** Number keyed notes independently by sheet, as opposed to consecutively by discipline or project.
- 214.9.3** Begin numbering keyed notes on each sheet that contains keyed notes with the number one. Number each note sequentially in ascending order.
- 214.9.4** If a keyed note is deleted, insert the comment "not used" in place of the deleted note or re-use the number for another note. It is not necessary to re-number keyed notes because of a deletion.
- 214.9.5** When a keyed note is used, show the keyed note legend on the same sheet where reference is made.
- 214.9.6** Do not use keyed notes for dimensions, CFM's or under any other circumstances that are inappropriate.
- 214.9.7** The keyed note symbol is an oval with a number designation. The standards established for text apply to the numeric character in the keyed note bubble. See 214.9.8 for an example of the preferred keyed note style.

- 214.9.8** The following are examples of the preferred formats for the keyed note legend.

### KEYED NOTES

- |   |                   |
|---|-------------------|
| 1 | KEYED NOTE 1 TEXT |
| 2 | KEYED NOTE 2 TEXT |
| 3 | KEYED NOTE 3 TEXT |
| 4 | KEYED NOTE 4 TEXT |
| 5 | KEYED NOTE 5 TEXT |

or

### KEYED NOTES ○

- |   |                   |
|---|-------------------|
| 1 | KEYED NOTE 1 TEXT |
| 2 | KEYED NOTE 2 TEXT |
| 3 | KEYED NOTE 3 TEXT |
| 4 | KEYED NOTE 4 TEXT |
| 5 | KEYED NOTE 5 TEXT |

**215 ELECTRONIC CAD FILE CONVENTIONS****215.1 Electronic File Naming Convention****215.1.1** Name electronic drawing files as follows:

09632M03.DWG

09632	=	LANL Project ID
M	=	Discipline (Mechanical)
03	=	Sheet Number

The electronic file naming convention applies to electronic drawing files created for studies, reports and construction document projects.

**215.2 Line Width Assignment in Electronic Files**

Assign lines a width by creating the line or entity in an appropriate layer. Each layer is assigned a color for the desired line width of entities created in that layer. As indicated in the table below, colors 1 through 15 are the extent of the allowable color range for LANL projects.

<u>Color Number</u>	<u>Line Width</u>	<u>Line Width</u>
	<u>In mm</u>	<u>In Inches</u>
1	0.50	0.020
2	0.50	0.020
3	0.50	0.020
4	0.50	0.020
5	0.35	0.015
6	0.35	0.015
7	0.35	0.015
8	0.35	0.015
9	0.25	0.010
10	0.25	0.010
11	0.25	0.010
12	0.25	0.010
13	0.70	0.030
14	0.70	0.030
15	0.50	0.020

### 215.3 CAD Layering Guidelines

#### 215.3.1 Maximum Number of Layers

Fifty (50) is the preferred maximum for the number of layers in a drawing file. In extreme cases, it is acceptable to increase the number of layers to a maximum of 100.

#### 215.3.2 Layer Naming Convention

Use the AIA CAD Layer Guidelines for establishing layer names. The only exceptions to those guidelines are:

- C The addition of a "G" (for general) group in the major groups. The "G" major group is added for general information that is not discipline specific, such as Title Blocks, Title Sheets, Submittal and General Notes sheets and symbols that are applicable to all disciplines.
- C Do not exceed 16 characters in assigning any layer name. This allows for the addition of extra characters that are added to the layer name automatically when X-Refs are used and eventually bound to the file.

### 215.4 Electronic File Format for Final Deliverables

**215.4.1** Deliver the electronic drawing files in AutoCAD Release 13 format.

**215.4.2** If another graphics software was used to create a drawing file, deliver the file in a format that can be recognized by and converted to AutoCAD (ie: ASCII format, DXF file).

**215.4.3** It is preferred that only standard AutoCAD Release 13 options be used in creating drawing files, but third party software that is completely compatible and supportable by AutoCAD Release 13 is acceptable.

**215.4.4** The deliverable media for electronic files are CD disks. The entire project file can be stored on one CD, provided it fits. Label the disk with the official **PROJECT NAME, LANL PROJECT ID, STAGE** (Title II, Engineering Study, etc), **DATE SUBMITTED, ACAD VERSION/WORD PROCESSING PROGRAM** used to create the documents, **DESCRIPTION OF DOCUMENTS** contained on the disk. It should also be noted if any third party add on software packages were used to augment the standard AutoCAD package.

- 215.4.5** A "read me" file is required if special instructions are needed for other users to understand the drawing files
- 215.4.6** Bind all externally referenced (XREF) drawing files using the XREF Bind command sequence.
- 215.4.7** Identify the plotting scale on the drawing file as well as on the delivered media.
- 215.4.8** It is not necessary to identify the plotting scale if it is 1"= 1".
- 215.4.9** The preferred plotting scale is 1"= 1".

**301 SYMBOLS****301.1 Where to Use Symbols**

Standard symbols should be used on all drawings, whenever possible. The use of symbols can reduce the drawing time and clarify the drawings by the elimination of unnecessary details.

**301.2 Size of Symbols**

Symbols are not of a standard size. Their size can vary according to their use on drawings made to scale or not to scale. The size of symbols on drawings not to scale is dependent upon the complexity and aesthetics of the drawings.

**301.3 Symbol Types**

The following graphic symbols are not intended to be a complete listing of all possible symbols required for a project. If additional symbols are required, use standard industry symbols.



**302 CONSTRUCTION DOCUMENTS SYMBOLS**

The civil, structural, architectural, mechanical and electrical symbols, illustrated in Sections 303, 304, 305, 306, and 307 respectively, are to be used in producing construction documents, such as, Title I, Title II, Engineering Design Criteria, Conceptual Design Reports, and As-Built record floor plans.

Mapping symbols, illustrated in Section 308, are to be used on mapping documents.

**303 CIVIL DRAWINGS AND GRAPHIC SYMBOLS**

Prepare drawings design in accordance with the following:

- 303.1** The drawings are to be drawn to scale with column lines and north arrows labeled. Dimensions are to be shown in ft. and decimals of a ft. Elevations are to be shown in ft. and decimals of a ft. Civil drawings should include locations of utilities, large trees, valve boxes, water meters, fire hydrants, pressure reducing valves, thrust blocks and other features pertinent to a specific project. Refer to the mechanical drawings for lift stations, sumps, and valves, etc. Include in the Civil drawings site utilities 5 ft. beyond building perimeters. Electrical/Communications site plans may be separated from the utilities plans providing they are carefully coordinated.
- 303.2** Include in the site plan existing features such as buildings, roads, walks, parking areas, trees, underground and overhead utilities, etc. to effectively interface with the new project. Prepare the site plan from a current survey tied to known survey markers located in accordance with the New Mexico State Plane Coordinate System, central zone, and mean sea level elevations. The preferred scale is 1 in. equals 20 ft. Include in the plan information necessary for field layout of all elements of the new project.
- 303.3** Include in the plans existing and new features including final contours at appropriate intervals; spot elevations; finish grades for drainage; site improvements; plan and profile of roads, walks, and drainage structures; test hole boring locations; and log data (if available).
- 303.4** Include in the landscape and/or terrain management plan a plan of arrangement; list of a plant material; fences; signs; erosion control; irrigation systems; berms; furniture; screens; gravel areas; lights; and other landscape features and structures.
- 303.5** Show in the site utility plan existing and new utility systems in the area surrounding the project at a scale of 1 in. equals 20 ft. Prepare a plan and profile for new underground utility systems showing invert elevations and cover over the systems shown. Adjustments to the scale may be allowed to avoid excessive sheets and match lines.
- 303.6** Prepare design profiles for: Sanitary sewers, storm drains, steam and condensate lines, roadways and other facilities as required.

Prepare profiles or cross-sections for locations where new underground utility runs cross other existing utilities. Show new utility lines as continuous in profile with break lines provided to show changes in direction. Stationing for gravity sewers, storm drains and drainage channels shall progress down gradient. Progress stationing from left to right on the drawing.

**303.7** Reproduce the soil boring logs and required notes on the drawings per Standard Engineering practice.

**303.8** Include in the Grading and Site Plans the following:

- C Existing structural/utilities include type, size, and locations from survey information.
- C Manhole invert and rim elevations for existing sewers, storm drains, electrical manholes, etc.
- C New construction, items to be removed, and limits of work.
- C Clearing and grubbing areas.
- C Grading and paving existing contours, finished contours and spot elevations.
- C Stationing, NMPS coordinates or bearings and distances for location of facilities.
- C Boring test holes and logs where applicable.
- C Cross sections where major grading work is involved.
- C Erosion control measures and type (SWPPP).
- C Match lines of adjacent drawings.
- C Fencing (standard or security).
- C Pedestrian/vehicle circulation patterns, parking layout, striping.
- C Location map of sanitary landfill.
- C Traffic control/signals/signs.

**303.9** Include in the Landscaping Plans the following:

- C Planting/irrigation.
- C Recreational layouts.
- C Visual screening.

**303.10** Include in the Utility Plot Plans the following:

- C Location of facilities (no contours required).
- C All utilities and describe them as to size, type material and indicate fittings.
- C Location of all utilities.
- C Proposed points of intersections of all utilities crossings for interference.
- C Depth of cover for utilities.

**303.11** Include in the Roads Plans the following:

- C Geometric plan and profile, pavement markings, thickness, cross section, and traffic control devices.
- C Operational plan for vehicular circulation is required showing turnaround movements, ingress and egress.
- C Center line location, coordinates, or bearing and distances.
- C Stationing.
- C Curve data ( Show D, ?, R, T, L, PC, PI and PT).

- C PC and PT stationing.
- C P.I. coordinates and ?.
- C Typical section.
- C Culverts, ditches, and hillside interceptor benches and slopes.
- C Utility crossings.
- C Calculations for horizontal alignment.

**303.12** Include in the Road Profiles the following:

- C Ground line (existing grade at  $\text{CL}$  road).
- C Finished grade (top of finished surface at  $\text{CL}$ ).
- C Left and right curb profiles (if required).
- C Grades in %.
- C Elevations at stations and vertical curve VPC, VPI and VPT.
- C Elevations along vertical curve (if required).
- C Calculations for vertical alignment.
- C Culverts & utilities crossing roads.

**303.13** Include in the Road Cross Sections (Looking Downstation) the following:

- C Station, location, and scales.
- C Center line location.
- C Existing ground line.
- C Finished roadway surface and bottom of base course.
- C Show cut and fill lines and slopes.

**303.14** Include in the Storm Drain Plans the following:

- C Sub-structures size and location (To be relocated or removed.)
- C Existing storm drains.
- C Existing Sewers.
- C New storm drain location (Street or Coordinates and Bearings), stationing, curve data (show D, ?, R, T, L, PC, PI and PT), manholes and transition structures, and junction structure.
- C Catch basin location. (Tie to curb returns or  $\text{CL}$  road), type, size, top of invert.
- C Pipe length, size, type, and end inverts.
- C Utilities crossings - water, sewer, gas, oil.
- C Trench conditions.

**303.15** Include in the Storm Drain (Profile) the following:

- C Ground line (existing grade over storm drain).
- C Street names and stations.
- C Sub-structures (utilities) including crossings sizes, Interferences, and Elevations.
- C Stationing of beginning and end of sheet (match lines), manholes, structures, and grade changes.
- C Storm drain slope (ft/ft), top and bottom elevations (ft), length and D-

load of pipe or strength, box size, station, size, and direction of connecting pipe inlets, and transition structures.

- C Parallel existing storm drains.
- C Parallel existing sewers.
- C Blankets and encasement for sewers.

**303.16** Include in the Sanitary Sewers Plan the following:

- C Substructures (existing utilities), size, and location.
- C New sewer location (street or coordinates and bearings), stationing, curve data (show D,  $\theta$ , R, T, L, PL, PI and PT), manholes (type and all callouts from standard drawings), and sizes.
- C Encasement of sewer.
- C Curbs, driveways, and sidewalks to be removed and replaced.
- C Fire hydrants, valves, or meters to be relocated.










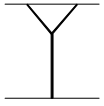


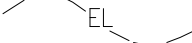
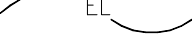

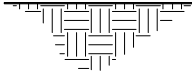
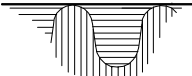



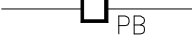



**303.17** Include in the Sanitary Sewers Profile the following items:

- C Existing ground line and proposed grade over  $\phi$  of sewer.
- C Substructures (utilities) crossing size, type, top and bottom elevations - (excavated and checked, if required).
- C Stationing of beginning and end of sheet (match lines), manholes, structures, and grade changes.
- C Sewer profile slope and elevations, (ft/ft) and (ft), length and type of pipe, station size and direction of connecting inlets or Y branches.
- C Parallel existing sewers.
- C Parallel existing storm drains.
- C Encasement for sewers.

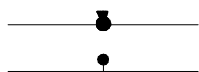
**303.18** Include in the Water Supply and Distribution the following:

- C Location of all structures and facilities.
- C Location, size, and type of domestic water lines, valves, valve pits, meters, etc.
- C Location, size, and type of fire water lines, hydrants, post indicator valves, and valve boxes and pits.
- C Coordinates at all angle points of distribution lines.
- C Bearing and distance between PI's.
- C Show utilities and structures along alignment.
- C Show invert elevations at all crossings - both utilities.
- C Calculations for alignment.
- C Typical trench sections and bedding.
- C Thrust blocks location and calculations.
- C Curve data, if required, D,  $\theta$ , R, T, L, PL, PI and PT.
- C Plan and profile if required; use applicable portions of sewers.

### 303.19 Civil Symbols

	BENCHMARK INDICATOR
	CONTROL ELEVATION INDICATOR
	MONUMENT NO = SEQUENTIAL DESIGNATION EL = ELEVATION
	BORING INDICATOR NO = SEQUENTIAL DESIGNATION EL = ELEVATION
	EXISTING ELEVATION INDICATOR
	FINISH ELEVATION INDICATOR
	EXISTING PROPERTY CORNER INDICATOR
	NEW PROPERTY CORNER INDICATOR
	PROPERTY LINE INDICATOR
	TOP OF SLOPE
	TOE OF SLOPE
	SURFACE DRAINAGE
	EXISTING CONTOUR EL = ELEVATION
	FINISHED CONTOUR EL = ELEVATION
	UNDISTURBED EARTH OR TUFF
	SELECT COMPACT FILL
	ROCK
	COURSE POROUS FILL
	FINE POROUS FILL
	VAULT
	PULL BOX
	MANHOLE
	CLEANOUT
	DOUBLE CLEANOUT

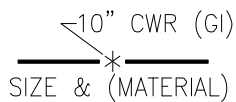
### 303.19 Civil Symbols (continued)



FIRE HYDRANT

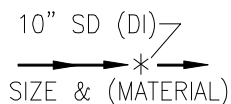


VALVE WITH ABOVE GROUND INDICATOR



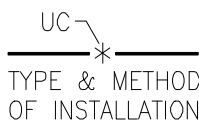
DISTRIBUTION SYSTEM

- \* CWR (CHILLED WATER RETURN)
- \* CWS (CHILLED WATER SUPPLY)
- ETC, PER MECHANICAL SYMBOLS



SEWAGE AND DRAINAGE

- \* SD = STORM DRAIN
- \* SS = SANITARY SEWER



POWER AND COMMUNICATIONS

- \* C = COMMUNICATIONS
- \* P = POWER
- \* T = TELECOMMUNICATIONS

- \* U = UNDERGROUND
- \* O = OVERHEAD



END SECTION



CATCH BASIN



HEADWALL



OVERHEAD LINE SUPPORT



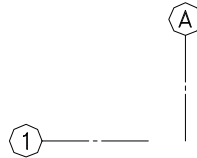
BARBED WIRE FENCE (SECURITY FENCE)



CHAIN LINK FENCE

**304 STRUCTURAL DRAWINGS****304.1 Designation of Column Lines**

**304.1.1** Show column lines as centerlines and designated in circles.



**304.1.2** Column line designations for new jobs shall be:

- C Horizontally by letter starting with A to the left.
- C Vertically by number starting with 1 at the top.

For existing conditions match existing column designations.

**304.1.3** Designate minor columns and posts by adding a suffix to the number or letter of the next major column to the left or above as the case may be. Obtain this suffix by proportioning the distance from the major column to the post to the whole bay width, i.e., 2.4, 2.8, B.d, C.h. Use lower-case letters for the letter suffixes.

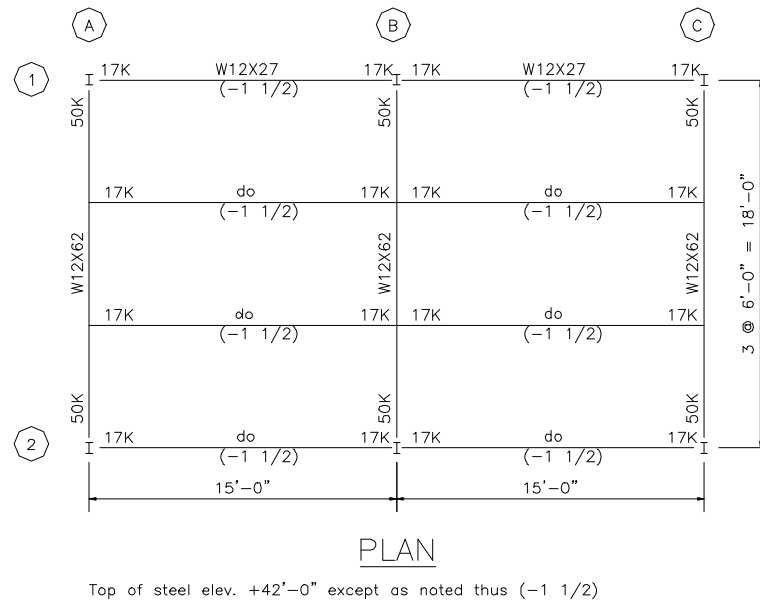
**304.1.4** On the Plot Plan and Foundation Drawings, locate structures by coordinates. The location of the coordinated shall be the intersection of the column lines in the northeast corner of the structure, where practical.



### 304.2 Structural Steel Framing Drawings

Framing Plans and Framing Elevations are schematic drawings. Show the centerlines of steel framing members as solid heavy lines stopping short of the member they frame into. Only show partial outlines of webs, flanges, and legs of members when necessary for clarity.

Example:



### 304.3 Structural Steel Shapes

Labeling structural steel construction, as per AISC "Structural Steel Detailing Manual."

### 304.4 Reinforced Concrete

Symbols commonly used on reinforced concrete drawings are:

#	To indicate size of deformed bar (superscript)
Ø	Plain rounds, e.g., spirals (superscript)
@	Spacing center to center
↗	Direction in which bars extend
↔	Limits of area covered by bars

**304.5 Structural Drawings****304.5.1 Dimensioning**

On plan views, dimensions are to be tied into points which can readily be transferred to concrete, steel, and other drawings including plot plans. Clearly indicate match lines and centerlines of columns and equipment. When possible, keep dimensions outside the equipment and details.

**304.5.2 Elevations**

- C Indicate elevations on Foundation Drawings in decimals of a foot, e.g., EL. 96.25. Indicate elevations on Superstructure Concrete and Steel Drawings in feet and inches, e.g., EL.115'-6 1/2".
- C Indicate floor and platform elevations to tip of steel. Reference floor plate, top of grating or top of slab as + or - elevation to top of steel.
- C Generally, the high point of the ground floor slab is to be the main vertical reference line.

**304.5.3 Co-Ordinates**

On the Plot Plan and Foundation Drawing, locate structures by 2 sets of co-ordinates. The location of the co-ordinates shall be the intersection of the column lines at corners of the structure, where practical.

**304.5.4 Loads and Reactions**

- C Indicate the design loads for principal equipment supported on the drawings in their respective locations.
- C Note foundation Drawings with "Max Foundation Pressure = \_\_\_\_\_ Lbs./Sq. Ft." Piling Drawings shall be noted with "Max Pile Load = \_\_\_\_\_ Lbs./Pile".
- C Show floor and roof live loadings as well as wind and seismic design basis for future reference and for floor loading postings.

**304.6 Reinforced Concrete Drawings****304.6.1 General**

In general, the drafting procedures shown in the "ACI Detailing Manual" published by the American Concrete Institute are acceptable.

**304.6.2 Reinforcing**

- Ⓒ Space reinforcing bars to the nearest inch, preferably, but in no case shall they be spaced closer than the nearest quarter-inch. Call-out of bars should be in one view where practical.
- Ⓒ Note bar spacing in inches, and inch marks are not to be used, e.g., #6 @18. Dimension the "clear" distance from face of concrete to edge of bar on the drawing.
- Ⓒ Note bending details on the "Bending Schedule for Reinforcing Steel" where job requirements call for detailing the reinforcing. Show and identify bars cut in a section.

**304.7 Structural Steel Drawings****304.7.1 General**

- Ⓒ The drawings prepared by the designer shall convey the information necessary for the preparation of erection and shop drawings by the steel fabricator.

They shall indicate the type of construction, types of beams and columns, and shall provide all necessary data on loads, shears, moments, and axial forces to be resisted by all members and their connections.

**304.7.2 Connections**




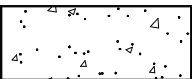
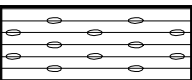
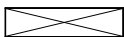
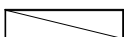


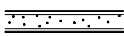



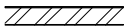
- Ⓒ Projects are to be shop welded and field bolted where possible.
- Ⓒ Holes for field connections are to be 1/16" larger in diameter than bolt. Holes in structural steel to match equipment hole locations shall be made 3/16" larger in diameter than connecting bolts. Holes for anchor bolts in column base plates shall be 5/16" larger in diameter than the bolt for 3/4" and 7/8" bolts and 1/2" larger for bolts 1" and over.

**304.7.3 Welding**



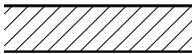
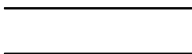
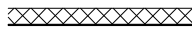
- Ⓒ Welding details and noted shall be made clear and complete. The size, type, length, and spacing must be given. Standard symbols and notations shall be in accordance with American Welding Society's specifications.
- Ⓒ A note of caution is given here with respect to welding to vessels which may be stress relieved before shipment to field. No field welded connections will be allowed and any connections which are to be made to such vessels must be done by the vessel fabricator.

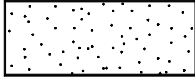
### 305 ARCHITECTURAL SYMBOLS

#### Indications for Materials in Large Scale Section

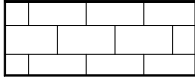
	UNDISTURBED EARTH OR TUFF
	SELECT COMPACT FILL
	FINE POROUS FILL (SAND)
	CONCRETE
	ASPHALT
	CONTINUOUS UNFINISHED WOOD
	DISCONTINUOUS UNFINISHED WOOD
	FINISHED WOOD
	RIGID FOAM INSULATION AND EXTERIOR INSULATION AND FINISHING SYSTEM (EIFS)
	GYPSUM BOARD
	PLYWOOD
	ACOUSTICAL CEILING PANEL
	CARPET
	STRUCTURAL STEEL

#### Indications for Materials in Small Scale Plan Views

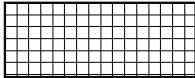
	BATT INSULATION
	CONCRETE MASONRY UNITS
	BRICK
	STEEL OR WOOD STUD WALLS
	STUD WALL WITH EXTERIOR INSULATION AND FINISHING SYSTEM (EIFS)

**305 ARCHITECTURAL SYMBOLS (continued)****Indications for Surfaces at a Small Scale**

ASPHALT, CONCRETE, GYPSUM BOARD AND  
EXTERIOR INSULATION AND FINISHING SYSTEM (EIFS)



CONCRETE MASONRY UNITS



CERAMIC TILE

**Indications for Surfaces at a Large Scale**

SHEET METAL

**306 MECHANICAL DRAWINGS AND SYMBOLS**

**306.1** Mechanical Drawings are to include plans, elevations, sections, details, equipment schedules/lists, etc., to clearly define the mechanical requirements of the project.

**306.1.1** Use double-line piping in congested areas and in congested equipment rooms as necessary to clarify the construction.

**306.1.2** Use double-line ductwork, except as may be specifically permitted. Show diffusers, grilles, and registers with sizes, flow rates and directions of flow noted on the drawings or in a schedule. Indicated all thermostats/sensors, duct mounted controls, control panels, etc., on the ductwork drawings.

**306.1.3** Fire protection piping drawings shall be on separate sheets and not included with other piping system drawings, except as may be specifically permitted.

**306.1.4** Include control diagrams and sequence of operations in the mechanical drawing set.

**306.1.5** Individual large scale mechanical equipment room plan and sections, and mechanical details are to be shown to fully designate the details of design.

**306.1.6** Draw mechanical equipment to scale with required maintenance and tube removal spaces outlined. Ensure that the equipment can be installed and/or removed without having to dismantle or remove other equipment.

**306.1.7** Indicate the outline of electrical equipment, including working space clearance, on the mechanical drawings (equipment room, plans, etc.) To ensure that the mechanical equipment does not interfere with the electrical equipment working space as required by the NEC. Do not locate mechanical equipment/piping (i.e., water piping, ductwork, pumps, etc.) above switch boards, panel boards, and motor control centers. Consult with the electrical section designer for the applicable code clearance requirements.

**306.1.8** Prepare flow diagrams for the following systems:

- C Chilled water/condenser water
- C Heating hot water
- C Steam/condensate
- C Compressed air systems
- C HVAC air flow systems

**306.1.9** Prepare riser diagrams (isometrics) for the following systems:

- C Potable/non-potable water
- C Sanitary waste/vent
- C Chemical liquid waste/vent
- C Industrial liquid waste

**306.1.10** Indicate (at a minimum) the following on control diagrams for the respective systems.

- C Thermometers
- C Pressure gauges
- C Balancing/control valves
- C Isolating valves
- C Flow transmitters
- C Temperature sensors
- C Automatic valves
- C Automatic dampers
- C Flow rates-air (CFM), water (GPM), steam (Lbs./Hr.)
- C Filters
- C Bypasses
- C Direction of flow

## 306.2 Mechanical Equipment List

MECHANICAL EQUIPMENT LIST				
ITEM NO.	LOCATION RM NO.	NO. REQ'D	DESCRIPTION, MANUFACTURER OR APPROVED EQUAL	FURN BY
1	RM 100	1	PUMP: .....	CONTR

**306.2.1** Provide a mechanical equipment list on Support Services Subcontract (SSS) construction projects. Do not use on fixed price construction projects.

**306.2.2** Provide only one mechanical equipment list for the entire mechanical set (HVAC, plumbing, fire protection, etc.) and locate on the last sheet of the mechanical drawing set.

**306.2.3** Indicate mechanical equipment items by an item number in a diamond. The item numbers shall be in sequence for the entire mechanical drawing set.

- 306.2.4** Note in the "FURN. BY" column if the equipment is furnished by the contractor (CONTR) or GFE.

### **306.3 Mechanical Symbols**

- 306.3.1** Use applicable graphics symbols on drawings and include a mechanical legend on the first sheet of the mechanical drawing set. If the AE selects to break the set into "m" sheets (mechanical), or "P" sheets (plumbing), the applicable legend shall be on the first sheet of the specific set. It is also permissible to use a dedicated sheet (first of the set, M1) For all mechanical symbols and abbreviations.
- 306.3.2** Pipe fitting symbols are depicted without a joint connection symbols. The joint symbol is optional, however, the symbols should be consistent throughout the entire mechanical drawing set. It is also preferred to note the type of joint (welded, soldered, flanged, etc.) In the specification and not by use of a symbol.




**306.3.3 Mechanical Symbols****(a) General**

POC	POINT OF CONNECTION TO EXISTING
POR	POINT OF REMOVAL FROM EXISTING
-----	EXISTING CONSTRUCTION
_____	NEW CONSTRUCTION
-*---*---*	EXISTING TO BE REMOVED
-----	HIDDEN CONSTRUCTION

**(b) Plumbing/Piping Air**

—— BA ——	BREATHING AIR
—— CA ——	COMPRESSED AIR
—— IA ——	INSTRUMENT AIR

**(c) Drain**

—— D ——	DRAIN
—— DWD ——	DEIONIZED WATER DRAIN
—— RW ——	RAINWATER (PIPING INSIDE BUILDING)
—— SD ——	STORM DRAIN (PIPING OUTSIDE BUILDING)
—— TWD ——	TOWER WATER DRAIN
——  ——	*FD = FLOOR DRAIN *FS = FLOOR SINK *RD = ROOF DRAIN

**(d) Fuel**

—— FOR ——	FUEL OIL RETURN
—— FOS ——	FUEL OIL SUPPLY
---- FOV ----	FUEL OIL VENT

**(e) Gas**

—— G ——	HIGH PRESSURE NATURAL GAS (GREATER THAN 5 PSIG)
—— GM ——	MEDIUM PRESSURE NATURAL GAS (14" WC TO 5 PSIG)
—— GL ——	LOW PRESSURE NATURAL GAS (LESS THAN 14" WC)
—— PG ——	PROPANE GAS

**306.3.3 Mechanical Symbols (continued)****(f) Laboratory Gases**

— AC —	ACETYLENE
— AR —	ARGON
— HE —	HELIUM
— H <sub>2</sub> —	HYDROGEN
— LN —	LIQUID NITROGEN
— N —	NITROGEN
— O <sub>2</sub> —	OXYGEN

**(g) Steam/Condensate**

— HPC —	HIGH PRESSURE CONDENSATE (ABOVE 15 PSIG)
— LPC —	LOW PRESSURE CONDENSATE (15 PSIG OR LESS)
— PC —	PUMPED CONDENSATE
— HPS —	HIGH PRESSURE STEAM (ABOVE 15 PSIG)
— LPS —	LOW PRESSURE STEAM (15 PSIG OR LESS)

**(h) Vacuum**

— DV —	DRY VACUUM
— WV —	WET VACUUM
— VPD —	VACUUM PUMP DISCHARGE
— CAM —	CAM SAMPLE AIR
— FH —	FIXED-HEAD SAMPLE AIR

**(i) Waste/Vent**

— ILW —	INDUSTRIAL LIQUID WASTE
--- ILWV ---	INDUSTRIAL LIQUID WASTE VENT
— RLW —	RADIOACTIVE LIQUID WASTE
--- RLWV ---	RADIOACTIVE LIQUID WASTE VENT
— SW —	SANITARY WASTE (PIPING OUTSIDE BUILDING)
--- V ---	SANITARY VENT
— SS —	SANITARY SEWER (PIPING OUTSIDE BUILDING)
VTR	VENT THROUGH ROOF
— SPD —	SUMP PUMP DISCHARGE

**306.3.3 Mechanical Symbols (continued)****(j) Water**

—— CWR ——	CHILLED WATER RETURN
—— CWS ——	CHILLED WATER SUPPLY
—— DWR ——	DEIONIZED WATER RETURN
—— DWS ——	DEIONIZED WATER SUPPLY
—— EF ——	EFFLUENT WATER
—— HWR ——	HEATING WATER RETURN
—— HWS ——	HEATING WATER SUPPLY
—— NPCW ——	NON-POTABLE COLD WATER
—— NPHW ——	NON-POTABLE HOT WATER
—— NPHWR ——	NON-POTABLE HOT WATER RETURN
—— NPMW ——	NON-POTABLE MAKE-UP WATER
—— PCW ——	POTABLE COLD WATER
—— PHW ——	POTABLE HOT WATER
—— PHWR ——	POTABLE HOT WATER RETURN
—— PCWR ——	PROCESS COOLING WATER RETURN
—— PCWS ——	PROCESS COOLING WATER SUPPLY
—— TWR ——	TOWER WATER RETURN
—— TWS ——	TOWER WATER SUPPLY

**(k) Refrigerant Piping**

—— RD ——	REFRIGERANT DISCHARGE
—— RL ——	REFRIGERANT LIQUID
—— RR ——	REFRIGERANT RELIEF
—— RS ——	REFRIGERANT SUCTION






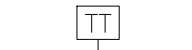








**306.3.3 Mechanical Symbols (continued)**
**(l) Fire Protection**

— FW —	FIRE PROTECTION WATER
— HA —	HALON
— ● —	PENDENT SPRINKLER HEAD
— ▼ —	SIDEWALL HEAD
— ○ —	UPRIGHT SPRINKLER HEAD
— ○ —	UPRIGHT SPRINKLER HEAD WITH PENDENT HEAD BELOW
— ▲ —	ALARM VALVE
— ◆ —	DRY-PIPE VALVE
— ◇ —	DELUGE VALVE
— ◇ —	PRE-ACTION VALVE
— Y —	FIRE DEPARTMENT CONNECTION
— Y —	FIRE DEPARTMENT CONNECTION—FREE STANDING
— FACP —	FIRE ALARM CONTROL PANEL
— HCP —	HALON CONTROL PANEL
— ● —	FIRE HYDRANT
— PIV —	POST INDICATOR VALVE

**(m) Fittings**

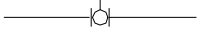
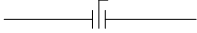
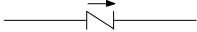




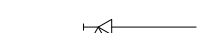

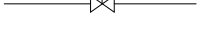
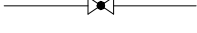

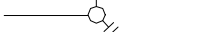
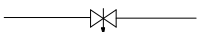
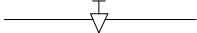
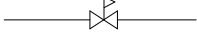

— E —	CAP OR PLUG
— [diagonal lines] —	FLEXIBLE MECHANICAL COUPLING
— [vertical oval] —	RIGID MECHANICAL COUPLING
— ○ —	ELBOW, TURNED UP
— C —	ELBOW, TURNED DOWN
—    —	FLANGE CONNECTION
— ▷ —	REDUCER, CONCENTRIC
— ▽ —	REDUCER, ECCENTRIC — BOTTOM OF PIPE LEVEL
— ▽ —	REDUCER, ECCENTRIC — TOP OF PIPE LEVEL
— ○ —	TEE, OUTLET UP
— ∩ —	TEE, OUTLET DOWN
—    —	UNION
— [shaded circle] —	END OF PIPE
— ◀ —	DIRECTION OF FLOW
— [L-shape] —	PITCH PIPING DOWN

**306.3.3 Mechanical Symbols (continued)**
(n) Switches, Sensors, etc

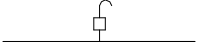
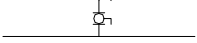

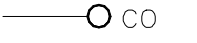
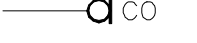
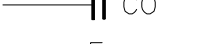


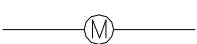
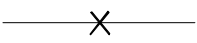
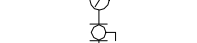

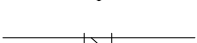
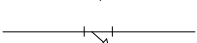
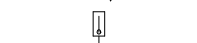
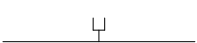

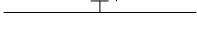
	ELECTRIC-PNEUMATIC SWITCH
	PNEUMATIC-ELECTRIC SWITCH
	DUCT STATIC PRESSURE SENSOR
	FLOW SWITCH
	WATER FLOW SENSOR/TRANSMITTER
	TEMPERATURE SENSOR/TRANSMITTER
	PRESSURE SWITCH
	PRESSURE SENSOR/TRANSMITTER
	TEMPER SWITCH
	THERMOSTAT
	HUMIDISTAT
	HUMIDITY SENSOR
	PRESSURE SENSOR
	TEMPERATURE SENSOR

**306.3.3 Mechanical Symbols (continued)**

(o) Valves

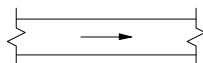
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	CONTROL VALVE, TWO WAY
	CONTROL VALVE, 3-WAY
	DIAPHRAGM VALVE
	GATE VALVE
	GATE VALVE, ANGLE
	GATE VALVE, OS&Y
	GLOBE VALVE
	GLOBE VALVE, ANGLE
	HOSE BIBB W/VAC BREAKER
	NEEDLE VALVE
	PLUG VALVE COCK
	PRESSURE REDUCING VALVE
	RELIEF OR SAFETY VALVE
	SOLENOID VALVE

**306.3.3 Mechanical Symbols (continued)**
(p) Piping Specialties

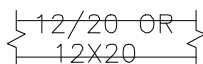
	AUTOMATIC AIR VENT
	MANUAL AIR VENT
	BACKFLOW PREVENTER
	CLEANOUT AT FLOOR
	CLEANOUT AT WALL
	CLEANOUT AT END OF PIPE
	EXPANSION JOINT
	EXPANSION LOOP
	FLEXIBLE PIPE CONNECTION
	METER
	PIPE ANCHOR
	PRESSURE GAUGE WITH VALVE
	STEAM TRAP
	STRAINER
	STRAINER WITH BLOW-OFF VALVE
	THERMOMETER
	TEST PLUG (PRESS/TEMP)
	TEMPERATURE GAUGE WITH VALVE

**306.3.3 Mechanical Symbols (continued)**
(q) Ductwork

BP	BUILDING PRESSURE
BMCS	BUILDING MANAGEMENT CONTROL SYSTEM
CAV	CONSTANT AIR VOLUME
HX	HEPA EXHAUST AIR
LX	LABORATORY EXHAUST AIR
MA	MIXED AIR
OA	OUTSIDE AIR
PX	PERCHLORIC EXHAUST AIR
PCM	PROGRAMMABLE CONTROL MODULE
RA	RETURN AIR
RLA	RELIEF AIR
SA	SUPPLY AIR
TX	TOILET EXHAUST AIR
VX	VACUUM EXHAUST AIR
VAV	VARIABLE AIR VOLUME



DIRECTION OF FLOW



INSIDE DUCT SIZE (FIRST FIGURE IS SIDE SHOWN)



DUCT SECTION, POSITIVE PRESSURE



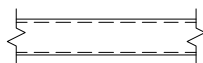
DUCT SECTION, NEGATIVE PRESSURE



DUCT PENETRATION, POSITIVE PRESSURE



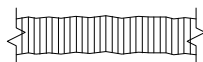
DUCT PENETRATION, NEGATIVE PRESSURE



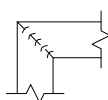
ACOUSTICAL DUCT LINING



FLEXIBLE DUCT CONNECTION



FLEXIBLE DUCT

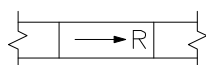


TURNING VANES

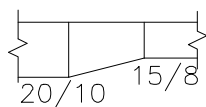


**306.3.3 Mechanical Symbols (continued)**

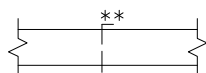
(r) Ductwork



INCLINED RAISE (R) OR DROP (D) \*



TRANSITION



DAMPER

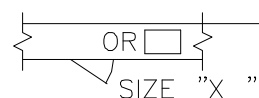
\*\* AD — AUTOMATIC DAMPER

\*\* BDD — BACKDRAFT DAMPER

\*\* FD — FIRE DAMPER

\*\* SD — SMOKE DAMPER

\*\* VD — MANUAL VOLUME DAMPER



ACCESS DOOR DUCT

\* INDICATE FLAT ON BOTTOM OR TOP (TOB OR FOT) IF APPLICABLE



SUPPLY RECTANGULAR CEILING DIFFUSER \*



SUPPLY ROUND CEILING DIFFUSER \*



SUPPLY SIDEWALL CEILING DIFFUSER \*



LINEAR SLOT DIFFUSER \*



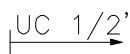
RETURN RELIEF, OR EXHAUST REGISTER OR GRILLE \*



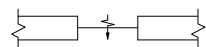
RETURN, RELIEF, OR EXHAUST SIDEWALL REGISTER OR GRILL \*



DOOR GRILLE \*



UNDERCUT DOOR \*



TRANSFER GRILLE \*

\* INDICATES CFM, SIZE, AND DIRECTIONS OF THROW ON DRAWINGS AND/OR SCHEDULES

**307 ELECTRICAL SYMBOLS**

Refer to the Facility Engineering Manual, Chapter 7, Drawing ST7001, for electrical symbols.